Digital Footprints and Changing Networks During Online Identity Transitions

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ABSTRACT

Digital artifacts on social media can challenge individuals during identity transitions, particularly those who prefer to delete, separate from, or hide data that are representative of a past identity. This work investigates concerns and practices reported by transgender people who transitioned while active on Facebook. We analyze open-ended survey responses from 283 participants, highlighting types of data considered problematic when separating oneself from a past identity, and challenges and strategies people engage in when managing personal data in a networked environment. We find that people shape their digital footprints in two ways: by editing the self-presentational data that is representative of a prior identity, and by managing the configuration of people who have access to that self-presentation. We outline the challenging interplay between shifting identities, social networks, and the data that suture them together. We apply these results to a discussion of the complexities of managing and forgetting the digital past.

Author Keywords

Social network sites; identity transitions; life transitions; digital footprints; digital artifacts; networks; online identity; transgender; LGBTQ.

ACM Classification Keywords

H.5.3. Information interfaces and presentation (*e.g.*, HCI)

INTRODUCTION

It is difficult, if not impossible, to exist in today's society without leaving digital traces. Online click data, credit card transactions, emails, and social media content such as status updates, photos, and messages are all collected and maintained in a wide variety of places, under the control of a wide variety of entities, and stored for indefinite periods of time. As datasets persist, they may no longer be representative of a person's identity, to the degree they ever were. At

times, this connection to one's history through data traces can be appealing. Many people enjoy looking at old digital artifacts and reminiscing about, for instance, the time before they had children, or the period when they dyed their hair red. However, for others, data from the past can be reminders of difficult times and identities they would rather forget or have others forget. Identity transitions are, for some, a substantial move away from a difficult past identity, a move that can be made more difficult by the persistence of *digital footprints*: the trails and artifacts that people leave behind when interacting in a digital setting [37]. Digital footprints link the past with the present in ways that may be problematic during identity transitions.

In this work, we describe how people manage digital artifacts during gender transition on Facebook. Our analysis contributes a deep understanding of how people manage digital artifacts and online social relationships during identity changes. How do social network sites (SNSs) enable and inhibit networked presentations of self? Studying gender transition, and in particular people who explicitly describe wanting to forget their former selves, allows us to understand the shifting of online artifacts and networks that occurs during identity changes, and how digital archives as default influences our lives in non-trivial ways. By understanding the experiences of people who rejected or actively managed artifacts of a past gender, we can understand the important and often problematic ways digital footprints continue to represent discarded identities to networks.

Transgender is a term that refers to "people who move away from the gender they were assigned at birth, people who cross over (trans-) the boundaries constructed by their culture to define and contain that gender" [3:1]. Importantly, a person's relationship to their gender is what matters here, not necessarily physical characteristics or changes. Following [21], we use "trans" for the remainder of this paper to refer to the broad transgender population.

On SNSs, pasts, presents, and futures come together as old digital artifacts resurface and may be viewed by social circles from different stages of life. During an extreme change like gender transition, a person's appearance is often completely different at different points in time [50]. Gender transition carries substantial social stigma as well as personal unease with one's past, which may create the conditions for particular difficulties when that past identity inad-

vertently (re)surfaces. Because few other identity transitions encompass such potentially drastic, numerous, and complex identity changes, gender transition allows unique insight into SNS practices. At the same time, gender transitions share similarities with many other identity transitions, particular those that involve difficult and incremental disclosures, such as breakup or divorce, job termination, and coming out as gay or lesbian. Understanding how digital footprints persist and networks change during gender transition on SNSs illuminates important aspects of SNS identity changes more broadly, and our design suggestions would benefit many with transitional or faceted identities. In this work, we highlight the interplay among changing identities, online social networks, and the digital artifacts that suture them together during gender transition, and discuss the complex nature of managing and forgetting the digital past.

BACKGROUND AND RELATED WORK

SNSs serve as personal archives containing memories from the past. Forgetting was once the norm and remembering the exception, but digital technologies have shifted the balance to remembering as the norm [35]. Facebook's Timeline, for example, presents itself as a literal representation of the events of one's life. Recent features such as "A Look Back" and "Year in Review" resurface past data to encourage reflection and deepen engagement with the platform. However, when considering one's life events, one would not want to revisit all past circumstances. Some events are mundane, while others are emotionally painful. Even for people with relatively static identities, interacting with past digital footprints can be problematic. The widely publicized Year in Review app, for example, universally applied the tagline "It's been a great year!" even for those whose years included death and loss [43].

Data on SNSs, though not viewed by users explicitly as comprising a personal archive, nonetheless are organized and curated into a sort of digital repository [55,56]. People value revisiting old Facebook posts for reminiscence [3,56]. Prior research has examined how people manage and reflect on digital data collections from the past, particularly how they keep and curate these objects both individually (*e.g.*, [14,16,18,19,23,26,40,42,47,55,56]) and collaboratively (*e.g.*, [47]). Complicated decisions must be made surrounding whether to keep or destroy old items [16]. Digital artifacts on SNSs can lead to focused reflection but may also limit the scope of what is remembered [47].

All digital content is a product of the context in which it was created [38]; information that may have been properly disclosed and privacy-appropriate when it was posted may become undesirable and inappropriate over time [25,41], particularly after substantial identity changes. To reflect upon whether and how personal archives should be maintained, Gulotta *et al*. [18] presented participants with systems that caused digital photos to decay over time. People were particularly resistant to this decay, in part because it was so antithetic to norms of how digital devices should behave and digital archives should be preserved [18]. However, some who have experienced major identity shifts may have felt differently; disappearance of photos of one's past gender identity, for instance, may be cathartic for some. Sharing past content with others is similarly temporally complex; Ayalon and Toch found that willingness to share Facebook posts significantly decreased as time passed, particularly when a major life change had occurred [2].

There may be great value in the ability to forget the past. Sas and Whittaker explored the emotionally painful experience of managing digital possessions after a relationship breakup, and found that digital artifacts' pervasiveness was highly problematic [46]. In the context of online reputation management, Woodruff found that not only is repairing an unfavorable online reputation unpleasant and disempowering, it is also often impossible [54]. SNSs, however, can enable their users to adjust past content and are in a position to improve user experiences by allowing problematic personal content from the past to be deleted. Another challenge users face when managing their digital footprints is contending with the potential social risks associated with exposed memories. For example, when parents manage their children's online identities, they must weigh benefits and potential risks of sharing photos and information about their children [28,29]. Similarly, trans people face a trade-off between sharing content and unintended disclosures of their trans identities. SNS design to support intentional forgetting could benefit those facing difficult life transitions [46].

People hold a wide range of perceptions and opinions around ownership of digital artifacts and which sorts of deletion requests and behaviors are appropriate [5,32]. For instance, social tensions can arise between photo owners and those tagged in photos [5]. Legal literature has discussed and debated people's "right to be forgotten," a vague set of rights recognized in the European Union allowing deletion or blocking of online data from one's past in certain contexts [25,27,45,53]. However, without an established legal framework, it is unclear whether and how the "right to be forgotten" will be applied practically in SNS contexts, particularly when concerning content uploaded by other people [27,53]. Right to be forgotten legislation could effectively draw long-contested ownership lines regarding digital artifacts like photos, giving control to those people in the photo rather than only the person who posted it, by mandating that certain photos be deleted [45].

Identities are socially constructed [4,36], and identity transitions are social [20,21]. Managing social relations during transitions is difficult and causes tensions, as people explore new identity presentations through technology by experimenting with appearance and behavior while negotiating interactions and relationships with others [20]. SNSs can be important places to find support while creating a new sense of self [21]. However, in this work we focus on the ways that an old identity's digital footprints can persist and complicate networked self-presentation on SNSs.

While we and the participants in our study necessarily contrast "new" and "old" identities, we note that new/old is a false binary. Gender transition is rarely a linear path from one gender to another – it instead may include pauses, regressions, and tangents [22] – and identity continues to adjust post-transition.

METHODS

We developed an online survey aimed at trans people who experienced gender transition on SNSs. Due to the nature of the research questions, the survey excluded people who transitioned prior to establishing a profile on an SNS. All of the participants whose data are included in the analysis had experienced a gender transition of some sort on Facebook, whether from male to female (MTF), female to male (FTM), or from a binary gender to a non-binary gender such as genderqueer, agender, or gender non-conforming. We used several methods to recruit participants and ask them to complete the survey. We shared recruitment materials on our social media profiles and encouraged our networks to share the link. Recruitment materials were emailed to several email lists targeted at the transgender and LGBTQ communities, and shared on LGBTQ and transgender-focused groups or forums on Facebook and other SNSs. We also distributed recruitment materials to our contacts at several health centers specializing in trans healthcare. We incentivized participation by entering survey participants into a drawing for a $500 Visa gift card. The survey was active for six weeks in 2014.

Given the sensitive nature of the subject matter, anonymous reflection on the gender transition experience was valuable. Thus, we gathered open-response survey questions on participant's experiences rather than interviews, to allow participants to anonymously reflect on their experiences. While survey-based work can be limiting because of the inability to ask follow-up or clarifying questions and to iteratively develop questions over time, online surveys afford anonymity that can give people space to reflect on sensitive topics and disclose personal experiences in ways they may not otherwise [24,49].

Although many people experience transition without any challenges related to SNS use, we were particularly interested in the ways digital footprints can be challenging. Thus, we asked the following questions (answers like "Nothing" and "N/A" were removed before calculating the descriptive statistics):

- What parts of transitioning on Facebook were especially difficult? Why were they difficult? (*N*=259, 61.37%, mean word count=27.44, range: 2-170)
- What do you think would improve the online gender transition experience on Facebook? (*N*=241, 57.11%, mean word count=22.80, range: 1-108)
- What would you change about Facebook to make it more friendly to transgender / gender non-conforming people? (*N*=203, 48.10%, mean word count=23.01, range: 1-143)

- Is there anything else you would like to tell us about your transition experience on Facebook? (*N*=112, 26.54%, mean word count=29.16, range: 2-176)

These questions were part of a larger survey effort; the survey is available as an Appendix in [21]. While our survey included questions about several SNS platforms, the data and findings in this paper are specific to Facebook, because it is the dominant SNS in the U.S., used by 71% of online adults [13] and by 98.9% of participants in our study.

The questions analyzed in this paper were phrased in a way that emphasizes negative experiences, which, while a limitation of this study, is not uncommon, even in widely used scales (*e.g.*, [10,31]). We do not claim that a finding of our work is that people faced challenges in managing digital artifacts on Facebook. Instead, we focus on *how* people manage and shape digital footprints and changing networks during identity changes.

Data

615 participants started the survey, but 40% either did not finish or were disqualified for not meeting the study's criteria. Some participants did not answer the optional open-ended questions. The optional questions analyzed in this study were between two sets of required questions, and 422 participants completed both of the required sets. Thus, we calculate the percentage of participants who answered the open-ended questions out of 422. Of these, our sample included 283 participants (67.06%) who responded to at least one of the open-ended questions listed above. The first author manually cleaned the data, removing responses from those who completed the survey despite not qualifying.

During our analysis, orientations toward forgetting the past and actively managing digital artifacts and networks inductively emerged (*N*=124 / 43.82% as opposed to *N*=72 / 25.44% who did not and *N*=87 / 30.74% from whose data this could not be determined). We analyzed data from all 283 participants in the final dataset to inform the results presented in this paper.

Participants could choose multiple genders and race/ethnicities (*e.g.*, a person may identify as transfemale and as genderqueer, white/Caucasian and Hispanic/Latino). As such, these demographic percentages add up to greater than 100%. 46.30% of participants identified as female/ transfemale/transwoman/MTF (F), 39.18% as male/trans-male/transman/FTM (M), and 25.48% as genderqueer, agender, gender non-conforming, non-binary, or a different gender (NB). Our sample was not racially diverse: 90.68% were white/Caucasian, 5.21% Asian/Pacific Islander, 5.48% Hispanic/Latino, 3.01% American Indian/Native American, and 1.92% black/African-American. The lack of racial diversity may be a result of our networks used to recruit participants, and is a limitation of this research. The mean age was 28.93 (*SD*=8.84, range: 18-66). We include quoted participants' gender abbreviations and ages in parentheses.

Participants reported a median of approximately 201-500 Facebook friends and a median daily Facebook usage of approximately 1-2 hours. On average, participants began their transition on Facebook 2.41 years prior to taking the survey (SD=2.07, range: 0-10) and began their transition overall 3.97 years prior to taking the survey (SD=4.60, range: 0-45).

Data Analysis

We initially approached the data using inductive open coding [11] and live coding techniques [30]. Live coding is an iterative, dynamic, and fluid coding process that employs a mixture of discovery and validation in the code creation process [30]. Allowing codes to "talk back" during live coding (*i.e.*, letting newly-discovered codes influence and change the meaning of other codes and the data itself in an iterative fashion) can enable a shift in the research focus, question, and frame [30], which happened in this work. Our analysis was not initially focused on digital footprints, changing networks, and persistent unwanted ties with a past identity, but this became our focus after it emerged as salient in the data. We discovered and validated these themes through our fluid coding process [30] and then used them to guide our analysis.

Once we focused on digital artifacts and changing networks, the first author developed a codebook and revised it through discussion with the other researchers, iteratively applying it to additional data. Our codebook (see Table 1) helped us understand how social media artifacts trace back to previous times and identities and how social networks change over time. After developing the codebook, we engaged in selective coding [11], applying dominant themes to the full dataset. Three researchers coded data from 50 randomly-selected participants and established inter-rater reliability at an acceptable rate (0.73). Then, the first author coded the rest of the data according to the codebook.

RESULTS

In this work, we highlight the challenges that arise when managing social data that are representative of a past identity in a networked environment. Challenges arise when digital footprints provide ties between past identities and current online networks. Participants reported how they managed digital artifacts such as photos, names, and gender markers. We detail the ways they edited, partitioned, and shifted networks to deal with context collapse [8] and control information disclosure during and after transition. Our results indicate that networks themselves are a type of digital footprint and managing the configuration of people who have access to one's shifting online self-presentation is heavily mediated by technological platforms.

Digital Footprints

On Facebook, digital footprints often persist long into the future. In this section we describe the types of data participants considered problematic when separating from a past identity, and some of the ways that they edited these data. In the context of gender transitions, digital footprints representative of a previous gender identity remain in many forms, including photos, names, and gender markers, each of which we detail below.

Photos

Photos were especially salient digital footprints for participants. Digital photos are an important means of communication, and also help to shape peoples' identities and memories [12]. Archives of digital photos remained on participants' Facebook profiles during and after gender transition, and could be removed only by either manually un-tagging photos, or by creating a new account entirely.

Any user with access to a particular photo, sometimes aided by a facial-recognition algorithm, can tag a person in a Facebook photo. Tagging creates a link between a photo and the tagged person's profile. Tagged photos often, but not always, contain the tagged person's image. Un-tagging photos (also sometimes called de-tagging) is a Facebook practice in which a person removes the link between a particular photo and their Facebook profile, and at the time of this writing must be done manually one by one.

When asked what would improve the gender transition experience on Facebook, many participants described their desire to be able to un-tag photos *en masse*, and the difficult feelings that arose when they could not:

More control over pictures, or maybe mass un-tagging. 'Cause I've got 6 years of pictures I probably need to go through and quite frankly, that's going to bring up some rough memories. (M, 26)

Even if one could un-tag all old photos, this would still not address more complicated issues like control over photos and the persistence of digital footprints, much as Sas and Whittaker found in the context of relationship breakups [46]. In the case of photos, there is no clear idea of who "owns" a photo. Is it the property of the photographer, the person who posts the photo on Facebook, the people in the photo, or some combination of these? When someone else posts a photo, a person can un-tag themselves, but cannot delete the photo. To address some of these tensions, Besmer

themes	digital footprints			changing networks: ways of partitioning networks			
codes	photos	names	gender markers	partitioning network on a current account	editing network on a current account	maintaining multiple accounts	moving to a new account
Percentage of participants assigned each code based on open-ended survey responses	19.08%	19.43%	18.73%	20.14%	5.65%	4.95%	7.77%

Table 1. Prevalence of themes and codes in the data.

and Lipford designed a Facebook application allowing users to request photos they were tagged in to be restricted from particular people or groups of people [5], but this functionality has not yet been incorporated into the site. In our study, lack of such privacy tools caused difficulty for participants, one of whom (NB, 38) stated it was *"still difficult that some pics of me before I cannot delete ... It's mortifying."*

Many participants desired more control over pictures posted and tagged by others. Although Facebook allows users to approve tagged photos before they are posted to their timeline, this participant described shortcomings in this feature:

I have several times put the settings to notify me when someone else is trying to tag me in a photo, asking for my approval. Sometimes it works, but then changes back, sometimes it doesn't seem to have worked at all. It is not nice to suddenly open your Facebook and see a picture of 'the old you' someone else has posted – and know that everyone on your feed saw it too before you had the chance to un-tag yourself. (M, 26)

Photos of one's former identity can also surface algorithmically. As one participant (F, 34) stated, *"it was a horrible experience when the auto-tagging algorithm suggested [my dead name] in pictures of me."* "Dead name" refers to a trans person's birth name, and for many, is rarely disclosed to others. This person had started a new profile, while keeping her old profile active, to manage separate audiences to whom they had or had not come out to as trans. However, algorithmic features like facial-recognition can result in potential leakages between accounts and faceted networks.

When a photograph of one's old identity surfaces, it causes complications within one's Facebook network(s). Even if a person only has one account, their network may include friends met post-transition, who may not know that that person is trans. Thus, the surfacing of an old photo can inadvertently disclose one's trans identity to their network:

I cannot delete photos others post of me and asking them to take them down may result in my having to come out to people I do not want to come out to. (M, 33)

While some in a person's network may be sympathetic and willing to curate photos to help a person present the online identity they wish to present (as found in [17]), others may behave in hurtful ways. For example, one participant described photo tagging used as a means of harassment:

People posting old pictures of me as a male and then tagging me in them with things such as 'this is what ____ really looks like.' (F, 23)

Digital footprints of an old identity can create conditions under which difficult social interactions occur, and may leave one vulnerable to discrimination and harassment. In these cases, online photo management during life transitions becomes a matter of more than just personal preference, and may be an area where "right to be forgotten"

could apply. Similar challenges undoubtedly also occur during other identity transitions, such as divorce and job termination. SNSs like Facebook must consider how to effectively allow separations between users' past and present identities. As participants in our study revealed, allowing mass photo un-tagging could be a first step along this path.

Names

For those who maintained a Facebook account throughout their gender transition, names often remained a persistent digital footprint. Although mechanically easy to change one's name, many social and technical barriers remained.

Socially, participants often delayed or resisted name changes for some period of time because it would mean "coming out" to their entire network at once:

Allowing people to choose who sees what name (if they're not fully out) – a way to use the settings function to choose, for example, that your family only sees your given name, might be helpful. (NB, 30)

Many participants lamented the technical and policy limitations of changing their names on Facebook, which often led to old names remaining as digital footprints. One participant described Facebook's name change policy, and went on to suggest ways to improve name change policies to allow for incremental, iterative changes:

You are limited to a certain number of name-changes before you are disallowed from changing your name again, which seems arbitrary to me. I would also make it easier to use initials or the like – early in transition I tried to change my first name to my first three initials, but it would only allow me to capitalize the first one. (M/NB, 28)

When rigid name policies challenge an individual's ability to change their name, sending messages and communicating with one another on the platform can become confusing. For instance, messages including old names can be a source of persistent digital footprints, resurfacing past identities. The Facebook URL itself can also behave as a digital footprint, making a past identity linger:

They should allow more than one change to the username (not your name, but the part that shows up in the URL). I'm lucky I never changed mine before transition, or I'd be in a very awkward situation. (F, 30)

Like un-tagging but being unable to delete others' photos, references to one's old name or gender in other peoples' posts allowed old identities to persist on Facebook. Manually removing such digital footprints was tedious:

Combing my post history in order to remove references to my original name/gender assignment was fairly tedious. I'm not sure it'd be feasible for them to build a tool to auto-change references to your name once you've changed it in your profile, but it would have been handy. (F, 26)

Managing digital content from the past on such a granular level takes immense emotional work, and requires reflec-

tion on one's past in a way that is challenging for many during identity changes. Participants' experiences show how social and technical barriers to name changes on Facebook often allowed previous names to remain on participants' profiles as persistent digital footprints of a past identity. Again, online identity management challenges faced by trans people mirror other identity transitions that may include name changes, such as marriage and divorce. When embarking on a divorce, a person may want their name change visible to some members of their networks and not others. At the same time, ties to one's married name may persist online in problematic ways. This analysis highlights the ways that iterative name changes and disclosures are often necessary during identity changes on SNSs, as well as improved capabilities for cutting ties with previous names.

Gender Marker

Privacy and disclosure options for gender markers are more nuanced than for names – that is, a person could choose to make their gender option viewable to only certain portions of their network. However, like names, it is not possible at the time of this writing to display one gender to some people and a different gender to others. This caused difficulties for participants during transition:

Changing my gender and having it visible has been the most difficult. It's a sure-fire way to come out to everyone and anyone who views my profile. I'm not ready for that yet. (M, 22)

Family members can persist gender markers in the way they describe their relationships to trans people. For instance, one participant (F, 23) stated that *"having people list me as their 'son' instead of their daughter"* on Facebook was especially difficult. Facebook currently only allows people to list family members using terms that correspond to their self-identified gender pronouns. However, some participants reported family members marking them with gender-inappropriate family-relationship terms pre-transition that did not shift when they updated their gender on Facebook:

Since changing my gender on Facebook to genderqueer I am listed as 'son' on my mother's page. It would be great if Facebook would replace that with 'child,' 'offspring' or some other gender neutral word that lets people know I am my mother's child without implying being male or female. (NB, 28)

This highlights the co-owned nature of family relationships as a digital artifact on Facebook and the self-presentation complexities it can invoke.

We have shown how, for some participants, gender markers remained as a persistent digital footprint linked to a previous identity. Although gender markers are digital artifacts uniquely important to trans people, other SNS status markers apply similarly to other identity transitions (*e.g.*, the "relationship status" marker for those facing divorce or breakup, or the "interested in" marker for those considering coming out as gay or lesbian). Because one cannot show

these markers differently to different facets of their networks, they may cause difficulties for those trying to distance themselves—often slowly—from a past identity. Effectively designing SNSs for identity change entails designing for networked temporal complexities, such as by providing markers that allow incremental disclosures and are not inadvertently linked with past identities.

Gender transition, like many identity transitions, is complex and involves difficult self-presentation and disclosure decisions, many revolving around management of digital footprints like photos, names, and gender markers. In this section, we described the ways that people navigated gender transition within the context made possible by Facebook's affordances and by their particular networks. However, at the same time as they worked within these constraints, some participants longed for other ways to manage identity changes, either iteratively or abruptly:

There's not a lot that is gender neutral about the defaults (i.e. default photos) so you must go all the way or not. Having a slightly more intermediate step where you're getting rid of photos that you don't want representing you, including profile pictures, but not entirely ready to fully come out, would be helpful, I think. (F, 27)

Maybe if there were a way to take your current profile and wipe it clean of posts, tags, etc., start fresh, but without creating a new account or losing your friends. Just a sort of 'rebirth' of the account. (M/NB, 28)

SNSs must take great care to design inclusively for users who wish to remove ties to past identities. In this section, we described the data that persist as digital footprints of a past identity, and how these data are managed. Self-presentational data are managed in relation to a network. Next, we turn to look at networks in detail and the ways that people edit and manage them during identity change within the constraints of a profile-based online platform.

Changing Networks

When managing identity transformation in an attempt to distance oneself from a non-representative past, it is often not enough to simply edit digital footprints, as we describe in the previous section. People must also manage the configuration of people on SNSs who have access to the self-presentation enabled by digital artifacts. This involves unique practices and strategies detailed in this section. A person's online identity is constructed and presented in relation to the social network that surrounds them [7], and networks can change rapidly during identity changes.

Many participants explained that transitioning on Facebook was difficult because of the people in their networks, not because of the interface itself:

It's a scary thing, but only because of other people. (F, 20)

As much as some participants explicitly stated that their networks, rather than the Facebook platform, were problematic during transition, difficulties may be compounded

by the ways that Facebook mediates these networks. To be able to use Facebook as a social platform, participants faced difficult decisions around how to manage their changing networks.

To explore the multiple, varied, and complex ways that networks change and are partitioned during gender transition, we consider two characteristics of network members in relation to participants: participants' desire/necessity to disclose their trans identity to that person, and length of time that person has been in the participant's life. As an example, during the identity exploration and transition process, many participants partitioned (or wished to partition) their networks to allow family members (low desire to disclose trans identity) to see some content and certain friends (high desire to disclose trans identity) to see other content:

The most difficult part was being able to maintain a closeted status to certain people (family) while being out to others (friends). (F, 27)

Similarly, many participants partitioned their networks depending on network members' newness to their network: new friends and acquaintances would see different content than old friends. However, even after making difficult decisions surrounding network partitioning, determining how to manage disclosure of an emerging trans identity on Facebook presented another hurdle. Often, participants attempted to partition their Facebook networks to mirror boundaries between facets of their networks in the physical world, similar to Vitak and Kim's [52] findings. To do this, participants employed four primary methods:

- **Partitioning network on a current account** (*e.g.*, using lists, groups, and privacy settings)
- **Editing network on a current account** (*e.g.*, by unfriending certain people and adding new people)
- **Maintaining multiple accounts** to partition old networks from new networks
- **Moving to a new account** and deleting the old account

Partitioning network on a current account
Many participants maintained their pre-transition accounts while using advanced features like lists and privacy settings on particular posts to manage disclosure to particular portions of their network. These practices may lead to increased stress for users [21] because they then must predict and manage certain people's reactions to their transition. For example, a participant (NB, 23) described having *"to decide who I would allow to see my gender-related posts. I was forced to critically analyze my relationships with family and friends in an effort to predict their reactions. In some cases, I expected someone to be supportive, but they turned out to be very much the opposite."*

Another participant discussed the worrisome nature of differential trans identity disclosure:

I use the [Facebook] lists to hide certain data from some people, and I don't want to worry about how often Facebook decides to change their settings. (NB, 22)

This quote highlights important issues regarding lack of trust around Facebook content sharing settings, as well as the shifting temporal nature of privacy and disclosure. Something that is disclosed to only certain people today may not be limited to that same audience tomorrow. With this in mind, people must go beyond just editing digital footprints, and must also manage network facets as separate imagined audiences [7,34] who may receive self-presentation information. At the same time, managing intended audiences of present and future profile content does not address issues of digital footprints that remain from the past. Partitioning one's network today to control disclosure does not affect past content, unless a person makes the effort to manually change viewing settings on individual past posts and photos, which often must be done one at a time. Considering how to manage partitioned networks in multiple time frames makes identity management during life transitions particularly difficult, especially when digital footprints may bind past identities with current and future networks.

Editing network on a current account
Rather than, or in addition to, controlling content on Facebook, some participants described heavily editing their "friends list" on Facebook before transitioning. This may involve removing many of those family members and old friends to whom a person did not wish to disclose their trans identity, while perhaps adding new friends that they did want to disclose to, such as friends made in trans-focused online support groups. Participants chose which people to remove based on expected reaction or lack of support, or anxieties about particular past networks:

I transitioned in college and was exceptionally anxious about voyeurism from high school people, so I un-friended a bunch of people. (M, 25)

Deleting the vast majority of my friends [was especially difficult]. I legitimately didn't want to but I feared persecution. I also had to block my parents and a few others with stalker-ish tendencies. (M, 21)

Others used this method as a way to "reset" their accounts. One participant (F, 27) stated that *"cutting out most of my friends list and starting over"* was particularly difficult, but that she *"really needed an account reset."* The notion of an "account reset" or "starting over," as this participant discussed, reveals the ways that persisting digital footprints and social networks can make identity transition especially difficult on sites like Facebook, where site design privileges and expects static identities. However at the same time, for some, an account reset that involves heavy edits to one's friends list may instead allow a positive way to inhabit a new identity without the pressure of a persisting network.

Even after distancing themselves from some members of their old network by unfollowing them (which maintains a connection but removes that person's content from the newsfeed), some participants still faced harassment:

The 'unknown' or 'forgotten' friends -- people from far back in my past who I no longer follow on Facebook but who still have access to my profile, who would pop up and say ... not so supportive things. (M, 42)

Participants edited the configuration of their Facebook networks as a way of managing anticipated reactions and responses from others to their changing self-presentation, and avoiding harassment and difficult interactions. Disclosure decisions are complex and involve compromises and choices under uncertainty [1]. Those embarking on gender transition cannot accurately predict beforehand who will be supportive; thus, people are often overly cautious when pruning their friends lists.

Maintaining multiple accounts
Many participants created new accounts to partition their networks into those who knew their current selves and those who knew their past selves. On SNSs, multiple gender presentations can be partitioned in a way that can rarely be done in physical space. This is a way of fully partitioning, for instance, friends to whom one did want to disclose their trans identity, and family to whom one did not, as this participant described:

I maintained two separate accounts for over a year once I started worrying about how to control information about my identity between my friends that knew and my family that didn't. (F, 34)

Deciding whom to allow access to the new account was not easy; one participant (NB, 23) stated that *"deciding what groups to allow access to my new profile / blocking family from finding it"* was especially difficult.

Maintaining multiple accounts is an important way of managing non-representative digital footprints, and for some is a way to avoid editing content on the account representing the old identity. However, the networked nature of the platform may provide digital footprints that link the two accounts and that may expose a person's trans identity. One participant (F, 40) stated that the gender transition experience could be improved on Facebook by providing *"better support for two identities. Okay, a Trans* dropdown means you can mark yourself for your current gender state, but it's better to have a new identity then add people. If you keep the old one, you'll have to be out or purge past pictures, and if you decide to be un-out and become stealth, there's a record in people's minds. Still, if you have two identities, people can identify you by your common friends. There's natural curiosity about these things. Other tools that allow more anonymity are probably better for this."*

Necessarily, as a person begins using a new account more extensively, the new network becomes their primary net-

work. The old account and network may still exist and contain digital footprints of a past identity, but remain partitioned and distant from the new network. However, as this participant points out, maintaining two accounts does not eliminate disclosure concerns. Members of one's old network and members of one's new network may be interconnected, and one's new identity may be discovered by their old network if they do something as small as "liking" a status update on a friend's Facebook page. Not only does Facebook not offer *"support for two identities,"* the site prohibits multiple accounts per person. In contrast, sites that allow anonymous self-presentations may indeed be easier and less constraining online spaces for those with changing identities, as the participant stated above. However, network effects give Facebook a large amount of power. When one's social circle and support network is on Facebook, and when many trans-specific online support groups occur on Facebook, a person in transition may have difficulty leaving the site, despite disclosure concerns and problematic site-mediated networked self-presentation.

Multiple accounts are one way to manage differential identity disclosure during online gender transition. However, digital footprints and changing networks complicate the gender transition experience online, and cause many with liminal identities to have to actively, as one participant (F, 41) described, *"maintain a double life and prevent 'leakage' between online personae."*

Moving to a new account
Many participants deleted old profiles to free themselves not only of old networks, but also of the digital footprints that persisted on their previous account. One participant (M, 18) stated that Facebook would be friendlier to trans people if the site *"allow[ed] photos to be completely deleted so people don't have to make a new account."* When moving to a new account, online connections to those to whom one does not wish to disclose (*e.g.*, family) are entirely removed, while connections with those to whom one does wish to disclose (*e.g.*, old friends perceived to be supportive) are re-formed through the new account alongside new connections (*e.g.*, new friends made in online support groups).

Erasure of a past identity by deleting an old profile often meant erasure of past networks, whether or not a person intended the new account to be for new friends only. One participant (M, 53) stated, *"I lost the support of longtime friends. That really hurt at first. Many did not come to my new account,"* while for another (F, 29), *"When I made my new profile and deleted my old one, contacting people I had lost touch with was extremely stressful."* Others reported a trade-off between keeping people in their life and being seen the way that they wanted to be seen:

Deciding to create a new account and delete my old one was very difficult, because I had years of memories from seventh grade and beyond stored there. I had to decide whether it was more important for me to be perceived as

completely male with new friends or to maintain connections with old friends. I chose the former. (M, 21)

This participant's experience gives insight into the difficult nature of transitioning and leaving behind one's old identity, memories, and friends. Transition often requires a person to choose between several different selves and representations of self in personal historical digital archives. This participant had to choose between being perceived as completely male among a new network of friends and with few digital footprints to the past (which may even come across as suspicious to some), or risking not being fully perceived as male but maintaining his old friends and digital archives. Being perceived as completely male was placed in direct opposition both to keeping an archive of memories, and to maintaining connections with old friends. For this person, being perceived as completely male was important enough to sacrifice the memories and old friends.

Networks after gender transition

As time passes after transition, many people build new networks that include people who never knew them pre-transition, and thus may never know that they are trans. Achievement of such post-transition networks can involve erasure not only of one's previous identity as another gender, but also erasure of one's identity as trans. If a person maintains their original Facebook account rather than starting a new one, digital footprints may give away their trans status to new members of their network:

As I approached ~4 years into transition, I started a new job. I don't feel totally comfortable adding work friends on Facebook, because most do not know I'm trans and I believe they may find out if I missed an old photo or status. (M, 30)

Another participant wrestled with how to deal with the challenge of potential disclosure of their old identity to new friends through digital footprints, without erasing their past:

I've ... been constantly worried about whose friend requests I accept ... in my largely 'post-transition' professional life ... I don't want to delete or de-tag all pictures of me from before transition because I'd feel like I was trying to be stealth/erase my past, and I'm not. I'm also worried that it'll look weird/raise a red flag with people if I've had a Facebook since 2006 but NO pictures/text until 2011! (M, 25)

This highlights an interesting case, in which a lack of digital footprints can actually be problematic in relation to the past. To not raise "red flags" with one's new network, people must worry not only about whether to erase past digital artifacts, but also about creating a digital past that appears credible without exposing parts of their identity they do not wish to expose. For example, some desired to share old photos as part of temporally-related social media trends like Throwback Thursday, but felt conflicted about this decision because of new connections:

Being trans and being on Facebook ... can be difficult to know what parts of my life to share with others ... esp. Throwback Thursday. I want to share those childhood pics!! (M, 42)

This quote exemplifies how people may struggle to create a digital personal history that makes sense both to them and to the different facets of their networks.

Post-transition, some participants wanted to disclose the new identity to certain family members. However, one participant (F/NB, 31) described *"friending family members who I guessed might be supportive,"* and then becoming *"visible to other family members who probably aren't."*

Participants struggled with managing trans identity disclosure among different networks. Those experiencing other identity transitions, particularly those that may involve incremental disclosures (such as divorce or coming out as gay or lesbian) may face similar difficulties.

Networks as Digital Footprints

Digital footprints include more than just digital artifacts like photos and names; networks themselves, and the people in them, can also be a type of digital footprint. As people change and grow, and particularly during major life transitions, certain people in their networks become closer and others drift away. In the physical world, because friendships take effort to maintain, certain people stay in one's life while others do not. However, on SNSs like Facebook, it takes effort to remove people from networks; thus, online networks contain people who may have otherwise drifted away during an identity transformation. In this research, we make explicit the work that is done to manage and edit networks during identity changes. Network management practices are often similar to practices of managing digital artifacts, such as photos. In both cases, people critically evaluate their digital self-presentation and the potential audiences it will reach, then make difficult decisions around what to keep and what to discard.

DISCUSSION

For many who have experienced major identity transformations like gender transition, managing the past can be painful, particularly when it requires revisiting archives of a no longer representative identity. While a person can curate parts of their digital identity (*e.g.*, un-tagging photos), many other digital artifacts are beyond an individual's control (*e.g.*, photos posted by others). This paper has focused on Facebook, but we move now to discussing digital footprints on SNSs more broadly. Persistent digital footprints often give voice to a past that a person wishes to forget. With online identity transitions, people simultaneously manage both their self-presentation and the stage on which this performance occurs [15]. Here, people manage their self-presentation by managing the *data* (*e.g.*, photos, names, and gender markers) and their stage through the *network* (*e.g.*, by partitioning or editing networks, maintaining multiple accounts, or establishing a new network). Curating data and

friends are often both required to present oneself in a way that meets current needs and circumstances. Presently, digital footprint management involves innumerable and granular edits. In the context of life transitions involving discontiguous identities, requiring people to think deeply about each item may be an undue emotional burden. Without features to remove posts or un-tag oneself from photos *en masse*, people meticulously edit their data and manage their networks, workarounds that are time consuming and potentially emotionally harmful.

Users may have limited agency in presenting identities within SNSs [33] like Facebook that exert power and construct identities [51]. To paraphrase Butler, how can people have agency in identity self-presentation when identities are constructed through systems of power [9]? Within the context of SNSs, the power dynamic Butler describes extends to the entirety of how one presents themselves and their online identity. Butler argued that agency is possible within systems of power, but only through an active and iterative process taking place within the constraints of the system [9]. Thus, people can exert some agency in representing their changing identities on SNSs, but this agency is subject to the constraints of the site.

Beyond issues of personal agency in managing digital footprints, our analysis highlights several challenges in controlling digital footprints associated *with a platform*. First, platforms change over time, resulting in shifting of digital footprints *from the past*. How data are presented, archived, and stored on platforms determines the meaning of these data [6,23]. Persisting digital footprints bring past identities into the present, in a way that is not only personally difficult, but also may display data in a way that shifts its meaning. A status update from 2007 does not mean the same thing when encountered in 2015. This is especially true when a person's identity has changed substantially.

Second, during and after an identity transition, networks and digital footprints will continue to shift over time *into the future*. Our analysis highlights the complex nature of control over one's online identity and the digital artifacts and networks that comprise it. People are afforded many different means of managing their digital footprints and networks, but changes may not stick. A person can un-tag themselves from photos, but may be re-tagged later. One can delete their own photos, but managing photos uploaded by friends is a complicated and stressful process [32,44]. Managing networks is similarly contingent. People prune their friends list for many different reasons, and may not even intend to remove people permanently. Past friendships often remain as digital footprints in the form of co-occurrences in photos, old posts that both were tagged in, old messages, and mutual friends. Even if a person transitions to a new account, they may receive friend requests from members of their old network, and they may accept them. Digital footprints and the networks that surround them continue to shift over time, long after an identity transition.

Several implications for design emerged from our study, including suggestions from participants and those identified through analysis. To effectively serve those with complicated relationships to their pasts, SNSs should allow for mass un-tagging of digital artifacts representative of a past identity, and should allow names, profile pictures, and status markers (*e.g.*, gender, relationship status, interested in) to display differently to different facets of a person's network. In addition to these relatively surface-level fixes, HCI researchers and designers should also consider more deeply the ways that platforms are designed to encourage sharing and reflection and to maintain vast social networks with little effort. Our work demonstrates how this can be painful for some. Designing for forgetting and decay [2,35,39,46] are key areas for future design work. Mayer-Schönberger argued that perhaps we should give digital information an expiration date, to allow ourselves to forget things [35]. Along the same lines, what if an SNS required explicit work to maintain old photos and posts, rather than maintaining a personal archive by default? What would it look like for an SNS to be oriented toward people drifting away over time, as happens naturally in the physical world? Providing empirical understanding of the complex nature of managing digital footprints and networks during identity transition is an important first step toward designing for social forgetting and decay.

CONCLUSION
This paper reflects on the ways that digital footprints representative of a past identity, and the networks surrounding that past identity, often persist even in cases when people wish to forget that past. These results are based on an empirical analysis of experiences reported by 283 people who changed gender while using Facebook. Online data, in the form of photos, names, and gender markers, can provide a link between one's social network and their previous identity, which can be problematic when trying to separate from that identity. Thus, during identity transitions, people attempt to manage this link both by editing self-presentational data, and by editing the configuration of the network itself. People manage networks by partitioning or editing the network of people on a current account, maintaining multiple accounts, or moving entirely to a new account. In this way, networks themselves become a type of digital footprint. Because SNSs are often designed to support persistence of networks and engagement with the past, those who wish to edit digital artifacts and friends lists must do so manually, which is time consuming and can be emotionally painful. Designing explicitly for forgetting in addition to remembering is an important future design challenge.

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