See Friendship, Sort of: How Conversation and Digital Traces Might Support Reflection on Friendships

Victoria Schwanda Sosik[1*], Xuan Zhao[2*], Dan Cosley[1]
[1]Information Science, Cornell University
301 College Ave., Ithaca, NY 14850
[2]Communication, Cornell University
Kennedy Hall, Ithaca, NY 14850
{vls48, xz298, drc44}@cornell.edu

ABSTRACT
Inspired by conversational visualization tools and the increasing enactment of relationships in social media, we examine how people reflect on friendships and how social data and conversation may affect this. We asked 28 people to reflect on their relationship with a close friend either alone, alone but with access to Facebook's "See Friendship" page, or with the friend using their See Friendship page. Observation and interviews revealed a rich array of practices around why, when, and how people reflect on friendships; that both friends and data make reflection more positive, more focused, and more fun; that those are not necessarily good things; and that third parties are a common theme. These findings suggest a number of design considerations, including supporting different types of reflection, aligning the interface with important moments and content useful for reflection, and carefully considering the fidelity of the visualization and data presented.

Author Keywords
Social media, lifelogging, visualization, friendships.

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

INTRODUCTION
Researchers have made increasing use of "digital traces"—data generated as a by-product of people's online activity—to study social processes such as collaboration in Wikipedia and to build systems that leverage these data. For instance, credit card transactions [24] and social media content [22] have been used to both help people understand themselves and to help researchers understand human behavior.

In tools such as text messaging, email, discussion forums, and Facebook, these digital traces go beyond the individual and capture the communication that is an important part of expressing and developing relationships with others [29]. Thus, a natural question is to explore how technology might leverage these traces of communication to help people better understand their relationships with others.

Visualizations of workgroup activity (e.g., [8,16]) and individual email and chat archives (e.g., [28, 30]) are one such tool that may give people insight into how they interact with co-workers and friends. However, these tools are not widely used. And even for tools like Friendwheel[1] that are more commonly used, it is hard to evaluate them. Do they help people reflect on, or even improve, their relationships? Or, like much reminiscing in Pensieve [22], are they just a moment's diversion?

Following Sellen and Whittaker's critique of lifelogging [25], we argue that these systems do not spend enough time considering end uses. Technical challenges such as ubiquitous capture, opportunities provided by easily-computable features like authorship and timestamps, and aesthetic considerations that contribute to engagement are all important in system design. But without attention to how these tools and data support people's needs, practices, and values in reflecting on relationships, they are unlikely to succeed. Current work also focuses on supporting reflection by individuals, but reflection is often a shared activity that should be supported.

In this paper, we study these practices, needs, and values, with the goal of informing the design of tools to support them. We brought 28 people to our lab (14 individuals, 7 pairs), gave some of them access to Facebook, asked them to reflect on a close friendship, and interviewed them afterwards. We focused on three main questions: 1) *How, and why, do people reflect on their relationships?* 2) *How do digital traces affect these practices?* and 3) *How does reflecting with others affect the experience?*

RELATED WORK
"Reflection" is a slippery term, used to mean many things [23]. We follow Lindley et al. [18] in using the definition developed by educational development researcher Jennifer A. Moon. This definition draws on the discussion of reflection in several disciplines, characterizing it as a process that involves pulling together and trying to make

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.
CSCW 2012, February 11–15, 2012, Seattle, Washington.
Copyright 2011 ACM XXX-X-XXXXX-XXX-X/XX/XX...$5.00.

[*] Sosik and Zhao are co-first authors.
[1] http://thomas-fletcher.com/friendwheel/

sense of unstructured material. Reflection is a key component of both personal and professional development and helps to generate awareness of one's self and environment. Though it is often used in counseling when there are deficits, it is useful even when there are not problems to address [21].

Storytelling, through private journaling or listening and contributing to stories with others [15], is often linked to reflection. So is reminiscing, which can help people work through past events and serve social functions such as relationship maintenance [31]. While people can reminisce about a wide array of topics, they often reminisce about and with other people [5].

We aim to build on this work by better understanding specific practices and outcomes that might inform the design of technologies that support reflection. This leads to our first research question:

RQ1: How do people currently reflect on their friendships? When does this happen, what do they think about, and how do they feel about the experience?

Reflection is often supported by environments that provide a space and material to engage with [21], and system designers have increasingly used digital traces to provide these environments. While [4] finds that reminiscing about positive events using cognitive imagery boosts happiness more than using memorabilia, systems commonly use photos as a starting point (e.g., [26]) since they help people share and reflect on experiences [10]. Digital representations of physical objects can help families tell stories about their memories [27] and text-based social media has also been used to encourage reminiscing [22]. And more digital traces are coming, as personal informatics and lifelogging systems like MyLifeBits [11] gather vast amounts of information.

The question then becomes what to do with these data. Sellen and Whittaker point out that lifelogging researchers should explore potential uses of these systems, and that more data isn't necessarily better [25]. Li et al. also argue that personal informatics systems should help people collect and reflect on personally relevant information [17]. These systems are often used in unexpected ways. For instance, conversational visualizations (e.g., [28,30]) often prompt stories about people's pasts, even when this was not the tool's intended goal. Other work has explored how image and GPS data [14], SenseCam images taken 18 months prior [18], and other social media can promote different types of remembering and reminiscing [22].

The increasing prevalence of systems for reflection and digital traces of relationships, combined with our limited understanding of how and why these data might support reflection, led to our second research question:

RQ2: How does access to data about friendships affect the process and experience of reflecting on friendships?

Much of the lifelogging and visualization work in CSCW and HCI focuses on interfaces for individuals. Yet other people also play a key role in reflection, serving as both reasons and partners for reflecting on the past. As Halbwachs writes: "The individual memory, in order to corroborate and make precise and even to cover the gaps in its remembrances, relies upon, relocates itself within, momentarily merges with, the collective memory." [13] In this kind of collective reminiscing, people involved in the same events try to construct a shared representation, in which different opinions, feelings, and emotions are negotiated and communicated [20].

This reflection through conversation has a dual role: it both furthers goals such as identity management, affinity seeking, and image confirmation [6], while serving as a fundamental constituent of the relationship itself [7]. For example, self-disclosure through reflecting on past events both serves the function of uncertainty reduction [3] and becomes an important part of the relationship history [29]. These conversations also teach people how to reflect on relationships: when mothers and children reminisce together, it supports the child's understanding of the past and of other people's perspectives [9].

Thus, reflection is doubly social: it is often both *about* and *with* others, and a fundamental part of relationships. This, plus the opportunity we see for designing tools that go beyond individuals, led to our third research question:

RQ3: How does reflecting with a friend affect the process and experience of reflecting?

METHODS

We explored these questions through observing participants during a reflection task and interviewing them about their reflection practices, both during the task and in everyday life. At the beginning of each interview session, we observed participants completing a task where they were asked to think about a close friendship for five minutes. The instructions were deliberately broad, choosing "think" over "reflect" or "reminisce" because we didn't want to influence how people approached the task. The task also helped to ground the interviews by giving participants a recent experience of reflecting to draw on.

There were three variations of this task, which allowed us to observe and ask questions about how access to data and conversation with a friend impact reflecting on friendships. Seven participants completed the task as described above (*single/no data*). Seven others were asked to use Facebook's See Friendship page when thinking about their friendship (*single/data*). Finally, seven pairs of friends were asked to explore their See Friendship page and think about their friendship together (*pairs/data*). To make data collection more manageable, we didn't have a *pairs/no data* variation; our hope was that questions we asked about reflecting in everyday life would give us information about how people reminisce together without using digital traces.

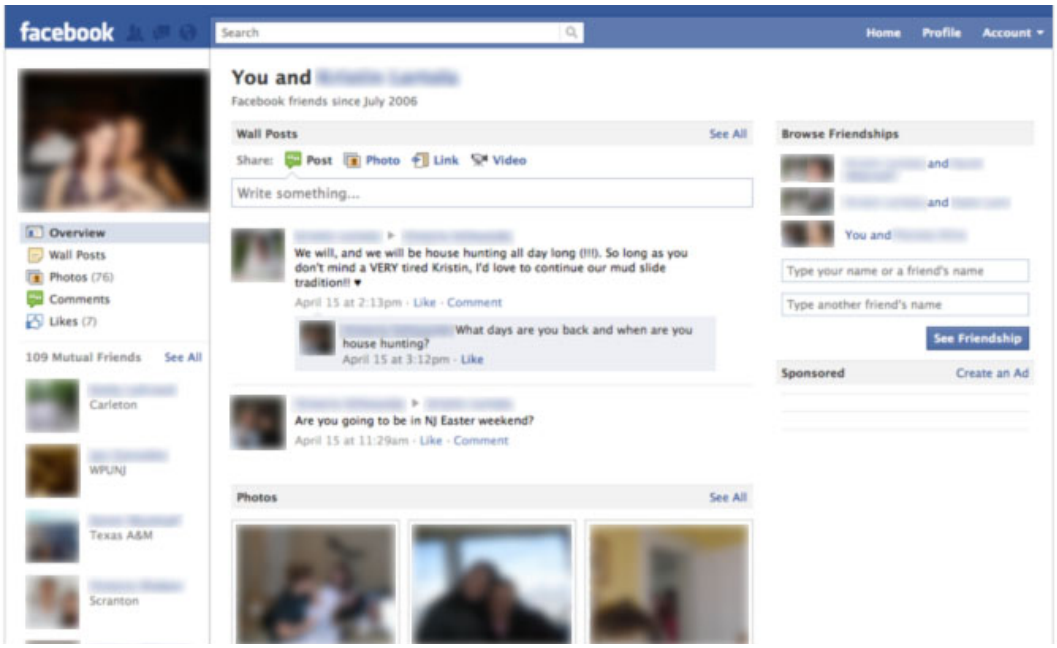

Figure 1. The top portion of the See Friendship page between two Facebook friends, which shows recent activity between the friends including wall posts, comments on each other's posts, and mutual events, photos, friends, and likes.

We chose See Friendship (see Figure 1) as our interface to digital trace data because it is an existing tool in a widely used social network. It gathers different media shared by two people, including wall posts and comments between them, recent photos, and mutual events, liked topics, and friends to "[tell] the story of friendships"[2]. People can use See Friendship with any Facebook friend and can access any two people's See Friendship page if they are friends with one and have access to both users' profile pages.

After the task, we video recorded in-depth, semi-structured interviews that lasted about 40 minutes. We first asked participants what they thought we meant by "think about your friendship", the types of things they thought about during the task and the experience of doing it, and how they think about their friendships in their daily life. We then asked them to draw on their everyday experiences to talk about how their reflection would have been different if they had done the two other task variations. Finally, we asked why and how they used the See Friendship page in daily life and how well it represented their friendships. We interviewed pairs/data participants together.

We recruited 28 participants from a large Northeastern US university (20 female, 8 male; median age 20; 16 White/Caucasian, 8 Asian, 3 Hispanic/Latino, 1 Black or African-American) who received course credit and were entered into a lottery for five $50 Amazon gift cards. We asked them to select a close friend they interact with at least once a month both on Facebook and face-to-face. If this friend was local, we asked if they would want to participate together. We recruited pairs in this way until we reached seven pairs. Fourteen others were randomly assigned to complete one of the two single task variations. Participants completed the Interpersonal Solidarity Scale (ISS), a 20-item measure of closeness in dyadic relationships [33], one week prior to and immediately after the interview. Our original plan was to use this scale to see how the task affected their feelings about the friendship, and whether there would be differences between the task variations. However, through our interviews it became clear that this interpretation of ISS outcomes might not be appropriate, a topic we will return to in the discussion.

To analyze the data, we used the constant comparative method [12]. Two researchers independently partially transcribed all videos and divided the data into chunks, which we organized into themes using concept charting [19]. We chose to conduct one analysis across all data, rather than separate analyses for each task variation, because participants seamlessly interwove discussion of the task with talking about their everyday practices around reflecting on relationships. Although we primed people with the different variations, participants had reflected on relationships in all three ways (without data, with data, and with a friend) in their everyday lives and drew on these experiences. Thus, many of our themes were supported across all variations; we call out cases where themes are primarily supported by evidence from participants in one task variation.

RESULTS

We now lay out these themes, organized around our three main research questions. Participant numbers are noted after each quote (1-7 did the single/no-data variation; 8-14 did the single/data variation; and pairs 15-21 did the pair/data variation, with the partners noted as 'a' or 'b').

[2] http://blog.facebook.com/blog.php?post=443390892130

How people reflect on their friendships

Participants described reflection as a complex set of activities: both spontaneous and intentional, both specific and general, both fun and awkward.

Reflection is both spontaneous and intentional

As in [23], we found reflecting on friendships was often unplanned and spontaneous, triggered by random cues such as common interests, related events, or online or offline co-presence with a friend. Some participants mentioned that daily use of Facebook—such as looking at posts, pictures, comments and likes—also sparked thinking about a friendship without explicitly planning to reflect on it. Reflection tends to be more explicit and intentional when there are problems such as arguments, or potential changes in the relationship because of life events.

"We talk about our problems but we don't really talk about our friendship. It's assumed to be OK...we both know we get along very well, we won't sit around and say I love you...we only have conversations about our relationship when bad things happen." (15-a)

"I don't usually intentionally think much, but during this time of year when everyone is about to leave the campus, it makes me think more about the relationship." (7)

Reflection is both specific and general

During the task and in daily life, people thought about their friendships on two levels: both about specific shared events in the past and about connections between these events and the development of their friendship. Thinking about "how we met" and the timeline of relationship development happened across all task variations.

"I started with when I first met her in middle school, and we got closer after middle school, so I went on and thought about how we were in the same class, and in high school she sat in front of me so we always talk...I guess the timeline is important because this is essentially how the relationship formed in a sequential manner…different events that bond you and make you closer." (2)

Reflections from those without See Friendship were more chronological and structured, starting from the beginning of a relationship and leading to recent events. In contrast, See Friendship's reverse chronological ordering led participants to start with the present. Reflecting on the evolution of friendships also included future events, particularly in the face of predictable changes such as graduation.

"[During the task] I thought about what he'll be doing in the future...I thought about what kind of things I could do with him in the future, and then I realized he's not gonna be here next year, it makes me realize, oh maybe I should talk more about him in the past." (7)

Reflection is fun, valuable, and sometimes awkward

Participants in all variations described reflection as valuable for friendships. Reflecting together helps friends value their friendship more, increases trust, and signals that they care about each other. Also, it's "fun". When reflecting alone, they realize how much they value the friendship and how good friends they are, which makes them feel happy.

However, for some participants reflection is an awkward, "touchy-feely" experience that they don't seek out in daily life. It can also be bittersweet.

"We became good friends through a really tough time with another friend who we are both close with…so reminiscing is somewhat bittersweet because we are still dealing with the repercussions from that." (15-b)

Since we used See Friendship as a trigger for reflection in the task, some participants described the experience as surprising because they don't normally look at past records on Facebook. For example, we observed them talking about unexpected Facebook interaction frequencies between them and their friends while they were trying to match that record with their offline interactions.

How data affects reflecting on friendships

As with their general reflection practices, participants painted a complex picture of how data and See Friendship were used in reflection. Funny content provides serious information, data sharpens but limits reflection, and See Friendship is accurate but incomplete and misleading.

Humor and media sharing can signal closeness

Participants often interacted with their friends through wall posts, messages and chat. Unsurprisingly, they use messages and chat for more personal, deep conversations since these channels are private. Wall posts were most often used for sharing media such as links to YouTube videos or articles, or for humorous content such as inside jokes.

"That's a lot of how we interact over Facebook, like 'oh I found this song and I thought you would like it' and she posts it on my wall." (13)

"When you're writing on someone's wall…it's just a short little comment that someone's going to see and you just want it to be something funny that you can laugh at in the library when you're taking a break and that's it." (16-b)

These "silly" elements, however, often helped people think about the evolution of their friendship.

"I noticed how the language has changed between each other...it used to be one short sentence which is kind of formal and now it's like a random video and we know the other person will like it...it shows we have a deeper understanding of the other person." (15-b)

See Friendship is mostly used to filter content

All participants were aware of the See Friendship page before the study, but used it "almost never" or "rarely". The most common use was as a filter to easily find a specific conversation, comment, or photo with a particular friend.

"I usually use the See Friendship page to look back on a comment, because it's easier to narrow down than going through my wall." (16-a)

However, once there, participants would sometimes use See Friendship to reflect in an unplanned way.

"If she wrote on my wall and I forgot what I wrote, then I would press See Friendship, which used to be See Wall-to-wall, and look what I had said previously…then there would be pictures also, which I may at that point start looking at those because they caught my attention." (2)

Many participants likened See Friendship to the See Wall-to-Wall feature that it replaced. See Wall-to-Wall was much like See Friendship, but only displayed wall posts. Some participants missed See Wall-to-Wall because it was both easier to use as a content filter and it felt less "creepy".

"There was the Wall-to-Wall feature before…that was better, it felt less dirty when you looked at it, but also…it was easier to [track conversations]." (18-b)

See Friendship is accurate, limited, and misleading

About two-thirds of participants felt that See Friendship is accurate and can represent the "overall tone" of a friendship. Attending events together, having pictures tagged together, posting inside jokes on each other's wall, and having a lot of Facebook interaction signifies closeness.

"I feel like [See Friendship] is a pretty accurate depiction of our relationship as friends…more just like having fun, and having fun in terms of us being friends instead of trying to fit into a bigger social scene…it's just between us, so…all the nonsense is inside jokes that we have." (2)

"I think [See Friendship] shows that we're together a lot, and people assume…we're close because of that." (18-b)

Some participants also felt that the See Friendship page helped them see the progression of their friendship through changes in their activity patterns.

"It's funny that there's a physical map of it almost, it can tell you the day…that we became Facebook friends, and how our conversations changed, and how we started talking more." (15-b)

However, even participants who felt that See Friendship was accurate saw it as limited and incomplete.

"It would be an accurate representation, it just wouldn't be a complete representation…there are things you talk to your friends about that you wouldn't post on Facebook because you don't want it to be public." (2)

One-third of our participants felt that See Friendship was not accurate and may misrepresent friendships. For instance, asymmetric Facebook activity doesn't necessarily mean a one-way friendship. Facebook was also described as "superficial", missing the personal communication that contributes to friends being close to each other. This communication often happens during "mundane", daily interactions that are not captured on Facebook.

"You definitely wouldn't get the evenness, or maybe the depth either of the friendship, because a lot of things that end up on Facebook are superficial." (16-b)

"There are a lot of things that are mundane that you do, that are quite important to the experience in general, just not quite exciting enough to say anything about…to make it worthy of a Facebook post." (10)

Facebook content also tends to be positive, with pictures of fun events or the humor that dominates wall posts, and therefore See Friendship under-represents negative events or feelings. Its representativeness also differs for different kinds of friends; long distance friendships were thought to be better represented because a higher percentage of overall interaction with them would be via Facebook.

Data focuses, but limits reflection

In the task, participants using See Friendship focused on exploring pictures and videos, wall posts, and mutual friends. They explored content chronologically, starting with the most recent, and visual elements appeared to get the most attention. This content served to remind people of events and activities, focusing their attention while reducing cognitive effort to reflect, at least for some participants. However, as with [4], participants described drawbacks to this reduction of effort. The triggers led some people to focus on just what was captured and not the deeper, more serious, and more personal aspects of their friendship.

"[It's] pretty good at reminding you of exactly what happened, what day you went, what was said...but it's bad at depicting the essence of the experience…it might actually limit the way you recall certain things." (10)

Likewise, the biases in what See Friendship captures led people away from mundane and negative events.

"[Without See Friendship] I would think more about personal stuff, like when I'm sad, and traumatic events…those events that make us closer together." (12)

As described earlier, a common way people approached the instruction to "think about your friendship" was by focusing on its development. Participants using data to reflect were less likely to talk about friendship development, but when they did, they would often use the data as a kind of friendship timeline to tell stories about what was going on in their friendship at the time of the posts.

"There were some insinuations of us being mad at each other, and having just gotten over it." (18-b)

"We'll go from like some really funny inside joke, to like hearts, so clearly we had just made up." (18-a)

People having access to data also remarked more often on patterns the data reflected, such as the changes in tone or asymmetry in frequency of Facebook posting between themselves and the friend they selected for the task. This was true whether they knew about this asymmetry before

completing the task or whether it was surprising and only realized after viewing their data.

Facebook's present focus and public nature affect its utility

For some participants, Facebook was not an effective tool for reflection because it privileges new content, though others found value in taking the effort to review the past.

"Facebook is always updating and always moving forward, forward, forward…there's no facility in Facebook to suddenly bring back memories." (21-a)

"[It] plays a role in [thinking about things we've done in the past that make us closer]…I think back to the pictures and it helps me have a better memory of what we actually did together, I was just doing that the other day." (5)

The differing levels of public-ness of various channels in Facebook also affected its utility. Participants felt that more private data, such as Facebook messages and chats, text messages, and other instant messenger logs, would be much more representative of their friendships. Some thought that it would be interesting to include this content on a private page just for themselves and their friend.

However, others were concerned about Facebook becoming the hub for this personal content and didn't have any desire for See Friendship, or a private version, to better represent their friendships. For some participants this lack of desire was less about Facebook, and more due to a feeling that strong friendships don't require or shouldn't have records.

"I don't think [Facebook] should have so much information that it's more accurate than you two hanging out together. If [it] knew more, it would take away from your friendship a little bit, everyone would know what it's like." (5)

How conversation affects reflecting on friendships

Participants engaged in both solo and mutual reflection in their daily life, and these modes are each useful in different ways. Interestingly, reflecting with other people, versus reflecting alone, led to some of the same kinds of tradeoffs as reflecting with data. Solo reflection is deeper, and often more general, but mutual reflection builds the relationship and stimulates reflection. Third parties also play an important role in reflecting on friendships.

Solo reflection is deeper and more structured

Participants said that reflecting alone leads to deeper reflection and more general evaluation of the friendship as a whole, while reflecting together often stops at the level of specific events. Just as data focuses participants' reflections, conversations about events can be very detailed, but they rarely turn into a reflective evaluation of the friendship unless the pairs intend to talk about these issues.

"When I talk to her and talk about things we've done in the past…just talk about how fun they were and how stupid they were...I also think about these things on my own, but when I'm talking to her I was not trying to connect that to any sort of emotional...if I were thinking about our friendship I'll more think about us as friends as opposed as things we've done as friends." (2)

Reflecting alone also appears to be more structured than reflecting with a friend, perhaps because people influence each others' thoughts through conversation.

"If we are in the same room and talking, it'll be more about what's happening now and what's current, as opposed to if I was thinking about my friendship with [a] by myself, I could start from the beginning…go back and from the beginning, talk about how we moved sequentially." (21-b)

Reflecting together can confirm relationships

The pair experience was described as "stimulating" and "fun". Participants also enjoyed the emotional experience of the conversation, such as when they shared laughter together. When reflecting together, friends also confirm each other's thoughts about the friendship, which was considered valuable.

"One nice thing about this is her confirming my beliefs about it...if I'm thinking this on my own it'll be like this is what I think and what I always thought, but I have no idea how she feels about it. A friendship is not a one-way street." (15-b)

Another participant said that talking actually helps to build the friendship.

"I think they have different functions....when I talk about memories and experiences with my friends, we'll have a fun time…which can really reinforce our relationship and make us more intimate." (12)

However, just as data leads to a focus on positive events, reflecting together might lead people away from saying negative or critical things.

"When we talk about it, we'll want to enjoy the moment so we won't talk about other sad stuff together. It'll be more positive than thinking on my own…I won't talk to her like, remember last time you cried?" (12)

Third parties play a role in reflecting on friendships

Mutual friends are often part of thinking about a friendship. For example, reflection on a friendship is often triggered by thinking about mutual friends or a group of friends with the same background (e.g., high school friends).

"When you share the same social circle, mutual friends come up a lot when you talk about stuff...a lot of times when you are reflecting on your own friendship, it's an extension of discussion of friendships with others." (10)

For some participants, See Friendship is used entirely from the third party perspective. For instance, awareness of publicity and concern for privacy influence people's decisions about Facebook activities.

"I just keep it in mind that it is a public area…you see others' pages and you make inferences so I thought about

how others might see my pages. With all my wall posts, there is an expectation that other people could see it." (6)

Consistent with this notion that Facebook is more intended for third parties, some people said they don't mind others accessing their See Friendship page. Even if displaying the data to third parties might risk a distorted view, most participants are not concerned about it, because mutual friends who have access to the page are supposed to have a better understanding of how they interact in real life.

"I think if our friends see us in real life as opposed to virtual like on Facebook, they'll understand it's mutual." (16-a)

However, people do think about others' reactions to public evidence of friendships.

"Lately I get nervous because I have been posting too many things on your wall." (15-b)

"Yeah some of our friends are sensitive about who's friends with whom, so that's why we are trying not to put it in people's faces that we are close." (15-a)

Even though some people think that See Friendship does not accurately represent their friendships, they still use it to explore relationships between others.

"I tend to be interested in…other people's friendships …mostly because I want to put mine in context." (21-a)

"We definitively check other people's see friendship page… it's natural because you want to know other people and it's there". (17-b)

Checking others' See Friendship might be simply triggered by Facebook's News Feed and link suggestions, but more often people are driven by curiosity to learn about others and get a sense of what their relationships are like.

"Yeah, [I use it] to see what pictures they had together and what they say on each other's walls." (17-a)

"Especially when they are in a relationship, you'll be curious about what they write to each other...I feel when I look at their pages, I'm definitely making assumptions about people…if they have many pictures together you might think they are really close and hang out a lot, or they know each other for a long time." (17-b)

DISCUSSION

Participants painted a nuanced picture of their practices around reflecting on friendships, and both digital traces and conversations with others change the ways people reflect and the value they get from reflecting. In this section, we discuss how these results might inform the design of tools that support reflection. We first explore how some of our themes suggest possible design moves, then turn to a more general discussion of how our results shed light on decisions that any tool in this space must address.

Data and people trigger reflection, but differently

Results showed that both having social media data and talking with a friend change the reflection process by focusing the experience, making it more fun, and bringing up experiences that might otherwise be forgotten. However, recent and positive experiences are privileged because social media data are associated with positive and sometimes superficial interactions. Similarly, when talking with friends, more details are filled in about a specific event, but the focus is on positive experiences because this kind of collective reminiscing supports relationship maintenance and individual well-being.

Systems can leverage this idea that data and conversation don't necessarily direct people to focus on the same "specific" and "positive" events to encourage different types of reflection. Social media triggers can be used to help people reflect on particular events, while the system could prompt conversations about the mundane with friends. The non-personalized text prompts in Pensieve [22] refer to mundane events like cooking and sunglasses, and might be well-suited for this sort of reflection.

Reflection as sensemaking and storytelling

Conversation and data both support a certain kind of sensemaking: when friends are trying to figure out what a wall post means and telling stories and laughing about it, they are compensating for and filling in gaps left by digital traces to create a more complete picture of events in the relationship and, sometimes, how it has evolved. This conversation leads to enriched social and emotional experiences around reflection that can help build friendships, adding to the value of reflection.

But individual reflection without data triggering is also necessary and beneficial for personal growth and reflection, mostly because of the negative memories that occur in the process [20]. Our results also align with findings that although pictures can lead to more vivid memories, encouraging free recall of events by using mental imagery is more effective in helping them recreate the same feelings or emotions as when their memory initially formed [4].

This suggests that systems could explicitly support storytelling as a form of reflection [15], allowing people to create narratives that connect multiple pieces of data and add context that is missing from what is explicitly captured. The system might even include algorithmic support for telling these stories, suggesting related content from both one's own and one's friends' digital traces. Allowing for both private and shared stories is important. Private stories allow people to work through negative emotions and add meaningful content that would not be appropriate to share in a semi-public system like Facebook. Others could be shared, allowing friends to create the bonding experiences and "fill in the gaps."

The embeddedness of friendships

Finally, people often try to relate one relationship to another and understand them in a wider social context. Reflecting

on a particular friendship is often accompanied by thinking about another friendship; some memories are better shared among a group of friends than between two people; and seeing or talking to mutual friends (both face-to-face and through the Facebook interface's links to other See Friendship pages) can trigger reflection on a friendship.

Third parties also come up in the discussion of whether digital traces such as See Friendship accurately portray a relationship. And though people sometimes felt that these digital traces presented incomplete or misleading views, they do seem to believe they can "see the friendship" of others. They explore others' See Friendship pages to learn and make inferences about their relationships, and compare those relationships to their own. Meanwhile, they consider third parties, and the semi-public nature of Facebook content, when thinking about what to post and to whom.

This probably does not surprise sociologists, but was something we did not expect because of our focus on particular friendships. Thus, tools should explicitly use these third-party relationships to structure and support reflection (this might be part of the secret to Friendwheel's success, for instance). In the relational context, allowing partners to create a "designed" public presentation of their relationships might support relationship development, comparison with others, and privacy management.

General considerations and questions

We now turn to a more general discussion of how our findings highlight questions, tensions and tradeoffs to consider when designing for reflection in this space.

Choosing appropriate levels of representativeness

The fact that See Friendship misses the day-to-day and personal interactions that make up much of a friendship, and focuses but limits how people think about friendships, leads to questions of how to represent a friendship through digital traces, and to what extent representativeness is necessary or desired in a tool aimed at simulating reflection.

Participants thought that private communication like SMS and IM would make a collection of trace data more reflective of a friendship because these media capture more day-to-day and personal interaction. Still, these would miss the face-to-face time spent with friends that was the most important gap for many participants. The face-to-face and the mundane matter, as with SenseCam images supporting connection, insight, interpretation, and awareness of change [18].

A straightforward design implication would be to capture more data, but, like Sellen and Whittaker [25], we question whether perfect representation would encourage reflection. Likewise, imposing structure on the trace data, though useful for some kinds of reflection (like timelines used to think about the evolution of a relationship), may fail to stimulate reflection in the way that messy, unstructured material begs to be made sense of [21]. The gaps themselves add value, providing occasions for joint meaning-making [13] as well as a level of ambiguity that can help relational partners maintain face [1]. Thus, we caution against trying to provide a "perfect picture" of a friendship, and based on our results, suggest supporting a variety of media, levels of detail, opportunities for individual and joint reflection, and so on, as a design goal.

Supporting both reflection and social comparison

The question of representativeness leads naturally to the question of who a digital trace record is designed for. Participants sometimes had strong feelings about See Friendship only being for themselves, or only for others. If the page is just for the two friends, then there is less concern about capturing more private communication, but none of our participants thought that it would be a good idea for the public See Friendship page to display more personal communication.

Further, they did not necessarily want it to be private. Being able to see third parties' digital traces of interaction, especially mutual friends, can support better understanding of one's own relationships, even though it is also sometimes seen as "dirty" and "creepy". Ironically, the ability to filter out activity that makes See Friendship a useful tool for finding content from a particular friend is likely what makes it seem less acceptable when used with third parties—somewhat like advertisers' aggregation of an individual's behavior across multiple web sites.

Technical approaches such as fine-grained privacy controls would be one approach to the problem, although they would likely suffer from classic problems: people are willing to give up their privacy cheaply and are often bad at using privacy interfaces. An alternate approach would be to recognize that there are many purposes for digital trace data and thus provide multiple tools and representations. Then the answer isn't to change See Friendship—it has its own uses, and for us it was simply a convenient, real interface that contained enough digital traces to support our task. Instead, the answer becomes to build appropriate environments for reflection.

Providing effective environments for reflection

This raises the question of where, and when, systems should be situated to encourage reflection. We saw several examples of how the norms around Facebook affected how participants used See Friendship to think about their relationships. The humor and positivity of Facebook content contributed to considering more positive events and aspects of friendship; the idea that Facebook is for recent events sometimes prevented people from using it to look back; the fact that See Friendship replaced See Wall-to-Wall may have influenced people's use of See Friendship as a content filter; and third-party use sometimes caused people to consider what kinds of content to post.

Thus, the system's interface, the content it contains, and its history and norms contribute to how one might use digital traces to support reflection. They also affect how one might integrate reflection into the system. We already argued that

See Friendship itself shouldn't change. But people are in fact triggered to reflect on relationships through their use of Facebook, and this could be more explicitly supported.

Interfaces that encourage reflection could also be integrated into other tools such as email, SMS, or IM clients. These archives of content could support reflection by bringing back elements of the past that are relevant to current content, supporting grounding, reflection, and conversation about past activity. Another option is to aggregate across media in a separate system. The Intel "Museum of Me"[3] creates a faux art exhibition that represents a Facebook user by aggregating their publicly available data. Integrating this with other traces and providing users with tools to curate their own collections, tell stories, and make meanings about their relationships might be useful. There are downsides to asking people to go to a separate site—it is more effort and less spontaneous—but that is one of the many tradeoffs afforded by this rich space.

Measuring Success Beyond "He Liked It"

These tradeoffs raise one final question. See Friendship was useful for filtering content and stalking third parties, but less useful for supporting reflection on friendships. But what does it mean to be useful for reflection, and how can we measure these outcomes? For instance, we found that after the interview, pair/data participants felt significantly closer to their chosen friend than single/no data participants according to the ISS scale of dyadic closeness. This means conversation and data are great for reflection, right? Or maybe reflecting together imposed social pressure to score their relationship higher (which is why we did not make any strong claims about this in the results).

A more general concern is that closeness may not be the right measure. Sometimes reflecting on a relationship might lead to a realization that it should change, or end. But it's hard to measure outcomes of reflection such as self-awareness and personal growth. Existing studies, including this one, are often exploratory, and/or focused on the design goals of the system. At some point we will need to move toward evaluations that go beyond "people liked it" and directly address the actual needs and practices that have come out of these studies. People want to reflect on both events in and arcs across relationships, do sensemaking and storytelling around the data and about the relationship, search for specific content and browse generally across archives of activity, reflect both with others and on their own, and think about their relationships as situated in their wider network of friends.

Thus, systems should set design goals that align with these practices and values, and evaluations should focus on them. These evaluations should also reach out beyond the lab. Reflection is both intentional and spontaneous, and usually more an ongoing activity than a specific task. This affects both tool design and tool evaluation, and suggests that both should be in it for the long haul. How can tools encourage repeated use over time? How can they help both researchers and users know that they are valuable? And how do they work when integrated into everyday life?

Limitations

Despite the need for long-term, natural evaluation, we too conducted a lab study. We also focused on close friendships, partly because they are important but understudied compared to romantic or family relationships, and partly because friendships often have more Facebook activity, which we needed in order to use the See Friendship page as our source of digital trace data. We recruited mostly co-located friends because of our desire to study everyday reminiscing and interview pairs together, but friendships at a distance may make use of social media for reflection more often, or in different ways. The pair methodology helped us see how people reflect together, but probably limited our participants to friends in good standing. Our participants were college students, and age affects how people reflect on the past [32], conceptualize friendship and use digital traces. And finally, although we saw no differences in how people responded based on gender or cultural background, these were not our focus, there might very well be differences that could be drawn out by studies that explicitly focus on those dimensions.

CONCLUSION

Still, we hope we have provided useful insights to build upon. We identified a number of practices and values that talking with others and digital trace data support in how people reflect on their relationships. Our findings around the role of storytelling and sensemaking align with other work around reflection on digital trace data, suggesting that this is a key element to support. Both the parallel effects of data and people on the character of reflection and the prominent role of third parties were surprising to us and hopefully useful to designers. Finally, we hope that our discussion of the issues around representativeness, goals, and evaluation, informed by our data, can nudge future work and designs in directions that will lead to better tools and, ultimately, better experiences for people as they seek to understand themselves and their relationships.

ACKNOWLEDGMENTS

We thank NSF for supporting this work under grant IIS 0835451 and a Graduate Research Fellowship.

REFERENCES

1. Aoki, P.M., Woodruff, A. (2005). Making space for stories: Ambiguity in the design of personal communication systems. In *Proc. CHI 2005.*
2. Baxter, L. (1992). Interpersonal communication as dialogue: A response to the "Social Approaches" forum. *Commun Theor*, 2, 330–337.
3. Berger, C., Gardner, R., Parks, M., Schulman, L., Miller, J. (1976). Interpersonal epistemology and

[3] http://www.intel.com/museumofme

interpersonal communication. In *Explorations in interpersonal communication*. Sage, 149–171.

4. Bryant, F., Smart, C. et al. (2005). Using the past to enhance the present: Boosting happiness through positive reminiscence. *J Happiness Stud, 6*, 227–260.
5. Cosley, D., et al. (2009). Using technologies to support reminiscence. In *Proc. BCS HCI 2009*.
6. Daly, J., Wiemann, J. (Eds.). (1994). *Strategic interpersonal communication*. Lawrence Erlbaum.
7. Duck, S., Pond, K. (1989). Friends, Romans, countrymen, lend me your retrospective data: Rhetoric and reality in personal relationships. In C. Hendrick (Ed.), *Close relationships*. Sage, 3–27.
8. Erickson, T., et al. (1999). Socially translucent systems: Social proxies, persistent conversation, and the design of "Babble". In *Proc. CHI 19*99, 72–79.
9. Fivush, R., Nelson, K. (2006). Parent-child reminiscing locates the self in the past. *Brit J Dev Psych*, 24, 235–251.
10. Frohlich, D., Kuchinsky, A., Pering, C., Don, A., Ariss, S. (2002). Requirements for photoware. In *Proc. CSCW 2002*, 166–175.
11. Gemmell, J., Aris, A., Lueder, R. (2005). Telling stories with MyLifeBits, In *Proc. ICME 2005*, 1536-1539.
12. Glaser, B.G., Strauss, A.L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Aldine Publishing Company, Chicago.
13. Halbwachs, M. (1925/1992). *The Collective Memory*, Harper & Row, New York.
14. Kalnikaite, V., Sellen, A., Whittaker, S., Kirk, D. (2010). Now let me see where I was: Understanding how lifelogs mediate memory. In *Proc. CHI '10*.
15. Kenyon, G.M., Ruth, J.E., Mader, W. (1999). *Restorying our lives: Personal growth through autobiographical reflection*. Praeger, Westport, CT.
16. Leshed, G., et al. (2009). Visualizing real-Time language-based feedback on teamwork behavior in computer-mediated groups. In *Proc. CHI 2009*.
17. Li, I., Dey, A., Forlizzi, J. (2010). A stage-based model of personal informatics systems. In *Proc. CHI*, 557–566.
18. Lindley, S.E., Glancy, M., Harper, R., Randall, D., Smyth, N. (2011). "Oh and how things just don't change, the more things stay the same": Reflections on SenseCam images 18 months after capture. *Int J Hum-Comput St*, 69, 311–323.
19. Lofland, J., Lofland, L. (1994). *Analyzing social settings: A guide to qualitative observation and analysis*. Wadsworth, Belmont, CA.
20. McLean, K.C., Lilgendahl, J.P. (2008). Why recall our highs and lows: Relations between memory functions, age, and well-being. *Memory* 16, 751–762.
21. Moon, J.A., (1999). *Reflection in Learning and Professional Development*. Routledge Falmer, Oxon.
22. Peesapati, S.T., Schwanda, V., et al. (2010). Pensieve: supporting everyday reminiscence. In *Proc. CHI 2010*.
23. Ricoeur, P. (2004). *Memory, history, gorgetting (Trans Blamey and Pellauer)*. University of Chicago Press.
24. Schwarz, J. Mankoff, J., Matthews, H.S. (2009). Reflections of everyday activities in spending data. In *Proc. CHI 2009,* 1737–1740.
25. Sellen, A., Whittaker, S. (2010). Beyond total capture. *Commun ACM*, 53, 70–77.
26. Shen, C., Lesh, N.B., Vernier, F., Forlines, C., Frost, J. (2002). Sharing and building digital group histories. In *Proc. CSCW 2002*, 324–333.
27. Stevens, M., Abowd, G.D., Truong, K.N., Vollmer, F. (2003). Getting into the Living Memory Box: Family archives & holistic design. *Pers Ubiquit Comput,* 7.
28. Tat, A., Carpendale, S. (2006). CrystalChat: Visualizing personal chat history. In *Proc. HICSS 2006*.
29. Taylor, D., Altman, I. (1987). Communication in interpersonal relationships: Social penetration processes. *Interpersonal processes: New directions in communication research,* 257–277.
30. Viégas, F.B, Golder, S., Donath, J. (2006). Visualizing email content: Portraying relationships from conversational histories. In *Proc. CHI 2006*.
31. Webster, J.D. (1993). Construction and validation of the Reminiscence Functions Scale. *J Gerontol*, 48, 256–262.
32. Webster, J.D., McCall, M.E. (1999). Reminiscence functions across adulthood: A replication and extension. *J Adult Dev,* 6, 73–85.
33. Wheeless, L.R. (1978). A Follow-up Study of the Relationships Among Trust, Disclosure, and Interpersonal Solidarity. *Hum Commun Res*, 4, 143–157.