I'm the Mayor of My House: Examining Why People Use foursquare - a Social-Driven Location Sharing Application

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ABSTRACT

There have been many location sharing systems developed over the past two decades, and only recently have they started to be adopted by consumers. In this paper, we present the results of three studies focusing on the foursquare check-in system. We conducted interviews and two surveys to understand, both qualitatively and quantitatively, how and why people use location sharing applications, as well as how they manage their privacy. We also document surprising uses of foursquare, and discuss implications for design of mobile social services.

Author Keywords

foursquare, mobile computing, social computing, check-in, privacy, location based service, uses and gratifications

ACM Classification Keywords

H.5.m Information Interfaces and Presentation (e.g., HCI): Miscellaneous

General Terms

Human Factors, Design

INTRODUCTION

For the past 20 years, researchers have being proposing a wide range of location sharing systems. With the increasing diffusion of GPS and Internet-enabled smartphones, many of these research ideas are finally being adopted by consumers.

We can broadly categorize [30] location sharing applications as *purpose-driven*, where people explicitly request another person's current location (e.g. AT&T FamilyMap, Glympse, Verizon Family Locator), and *social-driven*, where people broadcast their location to "friends" in their social networks. Examples of social-driven applications include, for example, BrightKite, Dodgeball (discontinued), foursquare, Gowalla, and Facebook Places. While purpose-driven location sharing applications have not yet achieved critical mass in any system, the same is not true for social-driven applications. In

particular, as of December 2010, foursquare claims to have over 5 million members [1]. This critical mass of users provides researchers with an excellent opportunity to investigate how people really use these systems and how people have appropriated them to meet their own needs.

While foursquare has features that distinguish it from other services, it is not yet clear which factors contribute to its popularity. For example, foursquare positions itself simultaneously as a mobile game, a way of exploring cities, a way of telling friends where you are, and a way of tracking where friends have been and who they have been co-located with [1]. Both its popularity and that of other location services raise many questions: What value drives people's use of these systems? How have users appropriated these systems, inventing new purposes for them to serve? Understanding these and related questions can offer valuable insights into real-world usage and can reveal design opportunities for new services and new applications.

Past work [5, 11, 22, 25, 30, 31] has found that privacy is a barrier to adoption of location sharing services. Current systems also face this challenge; however, it seems that for a large number of people, privacy concerns have not kept them from experimenting with and adopting this emerging technology. To gain some insight into this, we also investigated the kinds of privacy concerns people have with foursquare, and what strategies they take to manage their privacy.

In this paper, we present the results of three studies examining location sharing: (i) interviews (N=6) with early adopters to investigate how they use these systems and the value they construct through their use; (ii) a survey (N=18) qualitatively examining foursquare usage patterns and privacy concerns; and (iii) a survey (N=219) quantitatively probing questions about foursquare usage patterns.

This paper makes two primary research contributions. First, we show how and why people use foursquare, both qualitatively and quantitatively. Minor contributions include identifying surprising uses of foursquare, finding out where people do or don't check-in, showing differences between newcomers and longer-term users of foursquare, and the usage of foursquare to meet new people. Second, we investigate what privacy concerns people have and how they manage those concerns. Even though we found some new issues with respect to location privacy, we suggest that our participants are comfortable in managing their privacy.

THE FOURSQUARE CHECK-IN SERVICE

Foursquare describes their service as a "mobile application that makes cities easier to use and more interesting to explore. It is a friend-finder, a social city guide and a game that challenges users to experience new things, and rewards them for doing so. Foursquare lets users 'check in' to a place when they're there, tell friends where they are and track the history of where they've been and who they've been there with" [1]. Foursquare has clients for smartphones such as iPhone, BlackBerry, Palm, and the Android platform.

Foursquare lets people connect to friends, which are equivalent to the concept of friends on other online social networks. Users can check-in to locations to say that they are currently there. When doing a check-in, foursquare examines the user's current location and shows a list of nearby places. Users can also register new places.

When a user checks in to a place, a check-in notification is by default pushed to their foursquare contacts. People can choose to be notified of all check-ins by their contacts. At the time of the check-in, users can also decide if they want to check-in off-the-grid, in which the check-in is recorded by foursquare but not shared with contacts. These private check-ins still count towards gathering points, badges or mayorships (these are described below). People can also connect their foursquare account to other online services, such as Facebook and Twitter, and have their check-ins be announced on these services. Users who have checked-in to a place can also see who else has recently checked-in ("Who's here"). Users can also allow local businesses to view check-ins to their location.

The game aspect of foursquare offers virtual and tangible rewards for check-ins. Virtual rewards come in the forms of points, badges, and mayorships visible in one's public profile. Badges are awarded for a variety of reasons, e.g. for starting to use the service, checking-in on a boat, checking-in with 50 people at the same time, or checking-in at a special event. Mayorships are awarded to a single individual for having the most check-ins in a given place in the past 60 days, where only one check-in per day is counted. Some companies offer discounts for mayors of a place, for example, some coffee shops offer discounts on coffee.

Foursquare also enables social recommendations through tips, a small snippet of text associated with a place. Tips are intended to suggest possible activities for that place.

RELATED WORK

Foursquare's predecessor was Dodgeball, which was created by a co-founder of foursquare. Dodgeball was an SMS based check-in service, and was limited to major cities. Humphreys reports on a set of interviews about Dodgeball [15, 16], finding that Dodgeball provided mobile social connectivity and possibilities for "casual social congregation". However, in contrast to foursquare, the Dodgeball service didn't have game mechanics or other incentives for check-in integrated, and only offered limited information about people's check-ins due to limitations of SMS.

Ludford et al. studied people's willingness to share their locations in Sharescape [24], a place sharing system. They found that people didn't want to share "private" places such as residences and workplaces. In contrast, our work shows that such places are shared by a subpopulation interested in the gaming aspects of foursquare. The P3-systems project studied design requirements for location-aware community systems [19]. The authors found that such systems should support ad-hoc interactions with friends, family, colleagues, and strangers; show if a public resource is being used; facilitate task coordination; and help people avoid others. We saw that foursquare supports many of these features and we quantitatively report how they are used in a widely deployed system. There have also been field studies of location sharing applications. For example, Connecto [5] let users annotate their locations, and the location was shared continuously unless users disabled sharing. A two-week study of Connecto found that users used place naming as a way of social storytelling. Users also protected their privacy by vaguely defining their location. Rhub [14] also let people annotate place names by reporting their location using SMS such as "@pub". A user study of Rhub across 18 months with 150 users found that it was used mainly for coordination but not chat. Finally, Social Serendipity studied Bluetooth device encounters for social matching [12].

Our work in this paper is based on a classic two-part procedure established in marketing research for studying uses and gratifications [10]. We contribute to the research community's increasing understanding of how and why people use social media (for example, [3, 6, 18, 21]). These and other studies informed our research design, however, we note that foursquare's usage as a mobile social network and check-in service fundamentally differs from the usages of the above services, and therefore we naturally found different (even non-anticipated) uses for foursquare.

There has also been a great deal of work examining privacy issues in human-computer interaction. Iachello and Hong offer a survey of privacy [17]. There have been multiple studies regarding privacy and social media. For example, privacy on the Facebook online social network has been studied from many angles [13, 20, 29]. Our work is more closely aligned with studies on privacy in location sharing applications. Past work has examined many aspects of this problem. For example, some projects have examined how people set privacy policies [25, 31]. Other work has examined what people would share and with whom [11, 22], studied deployed research systems [5, 27], or examined the differences between purpose-driven request-based systems and social-driven broadcast systems [30]. Our work builds on this rich literature and contributes new findings about privacy concerns in a widely deployed system, as well as how users manage their privacy.

Finally, we note that safety, security and coordination of everyday life has been studied in the context of mobile phones in general [23]. Foursquare and other mobile social applications enable people to coordinate and inform about their safety without explicitly calling or sending SMS to people.

INTERVIEWS WITH EARLY ADOPTERS OF LBS

We started our work by investigating location based services (LBS) broadly to find out what kind of services besides navigation people have adopted. Specifically, we wanted to understand what LBS people used, what value they found in these applications, and instances of appropriation.

We conducted semi-structured interviews with 4 men and 2 women that were early adopters of LBS, ranging in age from 21 to 38. We refer to these participants as A1-A6. We recruited participants through Twitter, BrightKite and Loopt, and screened participants to only include iPhone users, to maintain homogeneity across applications and because, at the time, the iPhone platform offered the most options for LBS. Participants had been using their iPhones for an average of 7.9 months. Participants were given a $15 gift card.

Our participants used a number of location based applications, the majority of which were location sharing applications. Other applications included those for finding shops and restaurants, and travel planning applications.

We asked participants about their rationales for selecting specific applications, their experiences of use, and their perspectives on how they would most like to leverage location information themselves. The interviews were first processed in a round of open coding, where the data was conceptualized and coded. Following this we identified key themes across the open codes, which represented distinct topics from the interview data.

Interview Findings and Themes

Although we had a number of findings, we focus only on the check-in services, which all of our interviewees used.

Personal tracking - Participants A1, A3, and A5 expressed that they found value in using these applications to see where they have been in the past. A3 used a check-in service, and said that manually checking in is particularly important to him, as opposed to an automatic check-in system, because it provides a way for him to curate his location history and express what places he's been to that he felt were important.

Intimate sharing at a distance - A1 and A3 were involved in a long-distance relationship. They found value in checking-in as a way of maintaining a sort of passive awareness of each other. A2 had a desire for his significant other to use a check-in service for the same reason, but she was not willing to try. A5 had a very different take, saying his significant other was the only person who routinely checked in, but it was not useful "because I know where he is".

Discovery of new people - A1 expressed interest in meeting new people who shared her interests and were close by, "even if I'm busy." A2, A3, and A4 all shared experiences of having actually interacted with new people simply because they were nearby.

Running into friends - A2, A3, and A5 all shared experiences of running into friends who they didn't know were nearby because of their mutual use of a check-in service. A2 told a story of a friend who happened to be in the same neighborhood, so they grabbed a cup of coffee to catch up. Some situations were more functional. A5 was in a nearby city one afternoon for work and was planning to grab lunch alone. However, when he saw that a friend had checked in nearby, it prompted him to get in contact, and they ended up having lunch together.

Gaming aspect - At the time of the interviews, foursquare had only recently been launched. Participants A3 and A5 mentioned the gaming aspects of foursquare as reasons that they and their friends use it. For example, A5 mentioned a specific situation where he took a foursquare mayorship from somebody else that he knew personally.

Seeing where friends have been - A1, A4, and A5 expressed interest in seeing where friends had been, even if they cannot interact. A1 mentioned going to a shop after seeing one of her friends checked-in there the day before. A5 describes following updates of his friend's whereabouts as the friend took a trip through Thailand.

Routine vs non-routine places - Participants expressed reluctance to check-in at home, work, and other places that one might expect them to be at. One participant said that checking in signifies that "this place is interesting." Participants also said that being at new, unique, unusual, or non-routine places was often a reason to check-in, and that simply by arriving there they were reminded to check-in. Both A1 and A2 cited arriving at airports as a very distinct trigger to check-in. Furthermore, while the departing airport was an interesting place to check-in, the destination airport was more important, as it told their friends where they would be and sent a signal to friends in that area that they may be available to meet.

Potentially private places - A1 shared that she made it a point not to check-in when arriving at some private places, such as a friend's apartment. Her reasoning was that, while she did not mind if one of her contacts knew she was at the apartment, she wanted to protect her friend by not revealing the location of the apartment to others, who might have not had access to that information otherwise.

At large events - A3 told about being at the "South-by-Southwest" (SXSW) conference where foursquare was first announced. He said he checked in "everywhere", much more frequently than he would otherwise. He said this was "exciting" for him, and that he was trying to be as clear as possible to as many of his friends as possible about where he was, in case they wanted to meet up.

In summary, from the interviews, we saw several repeated themes from early adopters of location based services, for example, using these services as a game, offering awareness to friends, seeing where friends were, and using check-ins to meet with existing friends. We chose to probe these issues more deeply with surveys, focusing on foursquare, since it had a larger set of active users than other services.

SURVEY 1: QUALITATIVE USES OF FOURSQUARE

The goal of the first survey was to delve broadly into why and how people used foursquare, soliciting qualitative free-form responses. The goal of the second survey was to dive more deeply as to why and how people used foursquare, focusing on quantitative results. We modeled this approach on uses and gratification studies in marketing research [10], though we did not restrict our questions and analyses only to uses and gratifications. We discuss the first survey below.

Method

We solicited users through craigslist postings and flyers at Carnegie Mellon University campus. We compensated participants with a $5 gift card. For craigslist postings, we chose 20 largest US cities, 10 college towns in the US, and three major metropolitan areas in Canada. The survey included 55 questions, and we first asked our participants four open-ended questions, regarding benefits and drawbacks of using foursquare. We organized results into major themes below.

Participants

We received 25 responses (24 from craigslist) but excluded 7 because their public profiles revealed they had never checked-in. Of the 18 remaining participants, 9 were female and 9 were male, which is an acceptable division since foursquare claims that their male-female ratio is close to 60%-40% [9]. 7 were students, and occupations for the rest varied from casino employee, educator, and organic farmer, to software developers and managers. Two of our respondents were from Ontario, Canada, the rest were from the US. We refer to the participants in this study as B1-B18. The participants' activity on foursquare is shown in Table 1.

Results and Discussion

Foursquare Design Goals

Our first two questions asked why people used foursquare, and what they thought the benefits of using foursquare were. Many of foursquare's stated design goals were repeatedly listed as reasons, suggesting that foursquare is succeeding in achieving its design goals.

For example, 14 participants mentioned friends as the main benefit, in terms of sharing with friends where they are going and what they are doing. One participant mentioned discovering new places as the primary benefit. Aspects of location history were also described, e.g. keeping track of restaurants and bars to make it easier to go there again.

The designed features and game mechanics of foursquare also appealed to our survey participants. Three participants mentioned fun, though interestingly, three other participants described foursquare as just "something to do", especially when bored. Five participants mentioned earning points, badges, and mayorships as motivation for participating.

Discounts were mentioned by 5 of our participants. Two participants mentioned tips from other users as useful, using these tips to avoid going to places with bad reviews. Participant B9 commented that his check-in at San Diego Comic Con earned him a Superman badge, plus a mini superman

Activity	Min	Max	Mean (stdev)	Median
Days Out	11	276	94 (82)	55
Check-Ins	16	1201	300 (296)	242
Badges	0	32	14 (8)	12
Mayorships	0	29	8 (8)	4
Friends	1	48	18(15)	15

Table 1. Participant activity on foursquare in Survey 1

flashlight by showing the badge at a specific booth. Participant B6 remarked that foursquare benefited business for promotional purposes. Badges had also motivated participants to discover new places. One participant shared "There are location-specific badges that motivate me to go to new places", and another one "In order to earn badges I have gone to shops in San Francisco that I had not visited previously."

Finally, one theme that echoes a result from our interviews is discovering new people. Participant B18 said, "[foursquare] allows me to see what other users are in the same places as me." Participant B2 saw it as a benefit to "discover real facts about customers of the places. And, maybe too, know some new people."

Privacy Concerns with foursquare

Our third survey question asked about drawbacks of using foursquare, and the fourth question was about privacy. Since privacy was featured strongly in the answers to the third question, we combine the discussion of these two questions.

Six participants mentioned privacy as a drawback. There were the usual concerns about stalkers and strangers. However, when asked more specifically about their privacy concerns, 10 of our participants seemed comfortable with using the service. Roughly, half of the participants had privacy concerns, the other half did not.

Focusing on the half that did not have privacy concerns, many of them seemed to have a good mental model of how foursquare worked, and were able to use foursquare's existing privacy controls to manage what was shared with others. For example, participant B4 explained: "I do not have my home address linked to my account. I doubt I am interesting enough to be stalked." Some participants had only real-life friends as their foursquare friends. Three participants didn't link to Facebook or Twitter and therefore didn't have concerns. Participant B15 also said she didn't have concerns because she didn't share every check-in. Two participants went even further and stated that if you have privacy concerns you shouldn't be using services such as foursquare, Facebook or Twitter in the first place.

Focusing on the other half that did have privacy concerns, there seemed to be misalignment in terms of how people understood foursquare, as well as what privacy controls people could use. For example, Participant B4 was concerned that strangers might be able to track you. B4 and B16 mentioned the threat of stalkers. B5 remarked, "everyone knows where you are when you check in somewhere." Participant B11 wasn't sure he understood the existing privacy controls, and

B14 was concerned that somebody who she doesn't want to reveal her location to would nevertheless be able to see it.

Why People Don't Check-In

People had many interesting and surprising reasons for deciding not to check-in. Self-representation issues emerged, as they have for other location sharing systems [11, 25, 27, 31]. For our participants, one form of self-representation was to not check-in to fast food restaurants. Participant B1 explained "[I don't check-in to] Fast food. It's embarrassing to be seen there." Participant B3 shared, "McDonald's and the like... Because I don't need to remember it and I'm not totally proud to have said I was there." Participant B4 "Checking in at fast food restaurants too often is embarrassing.", and finally participant B9: "I never check in to fast food restaurants like McDonalds, Burger King, Taco Bell, etc. I don't think anyone would be impressed by that sort of check in." To a lesser extent, we saw similar decisions to not check-in for doctors and banks. In contrast, one of our participants shared that she is mayor of a McDonalds.

Other self-representation issues also emerged. Two participants did not want to check-in to places if they found it boring. B17 doesn't always check-in to his house "because it gets boring." Participant B11 expressed similar feelings: "I don't check-in at work. It seems like a boring place to check-in to. I go there everyday."

One interesting variant of privacy was regarding spam and interruptions. Participant B3 stated "Privacy, too much spam on my Facebook wall if it's integrated". This participant also said that spam was a reason not to check-in to a place, saying "because I don't want it cluttering my Facebook wall". We note that foursquare offers the possibility to opt-out of sharing check-ins with friends, Twitter, and Facebook.

To a large extent, these findings suggest that there would be many social challenges to having automatic check-in systems, in addition to technical challenges in correctly identifying which of several nearby places one is at. Furthermore, while fast food was a concern for several of our participants, we can generalize this notion by stating that there are places where specific subpopulations would be embarrassed to say they were at, but that this is not universal. For example, there are many people who would be embarrassed to check-in to a strip club, but a quick perusal of foursquare shows that there are also people who actively check-in to these locations.

Surprising Uses of foursquare

Some uses of foursquare we discovered were not part of explicit design goals of foursquare, and have not been documented in previous research literature on location sharing.

For example, one participant was concerned about her safety, she said: "I have stopped checking in at home after reading about someone having a close call with a stalker. I also check in at a location as I leave that place, instead of at the time I arrive." Another participant mentioned a similar use, saying that he often checked in when he got home to let his friends know he had returned safely. We note that similar issues have been discovered with the safety of social disclosure in online and mobile photo sharing [2].

People also mentioned other reasons for checking in at either one's own home or at other people's homes. Three participants said that they used check-ins at their own home as a signal for availability. This finding is in line with a study by Anthony et al. [4], where people wanted to share their locations when they were bored and wanted to be with friends.

Three participants said that they checked-in to their own home and friends' homes because they wanted to become mayor of that location. Participant B17 said that he is a mayor of his house, his mother's house and grandparents' homes (explaining that he's the only one using foursquare at those places). Even more interestingly, he was also the mayor of his friends' houses (who also used foursquare) because they don't check-in at home.

These check-ins at people's houses introduce potential physical security risks. The web site pleaserobme.com pushed an awareness campaign in 2010 about how check-in services and certain kinds of tweets make it easy for everybody to know when a person is not at home. Foursquare offers categories for places, one of which is "home." Furthermore, foursquare offers a public search of places, making it possible to search for terms like "house" and "home". In some cases, place names unwisely include the street address of the home. We do note, however, that there have not yet been any documented cases of such abuses or criminal activities. Thus, there is a tension between the benefits of foursquare, where people either want to win mayorships of as many locations as possible or signal their availability to their friends, and physical security of private homes.

SURVEY 2: QUANTITATIVE PROBING OF FOURSQUARE

For the second survey, we decided to dig deeper into several of the themes we saw in the interviews and the first survey. Due to space, we focus only on five themes: 1. why people use foursquare, 2. where they check-in, 3. usage of foursquare by newcomers versus longer-term users, 4. privacy, and 5. meeting new people.

We received 219 participants by posting flyers near Carnegie Mellon University (3), advertising on a local newsgroup (3), asking people to share on Facebook (4), requesting participants of survey 1 to advertise to their friends (5), as "tips" on foursquare (6), and through Twitter (90 from a retweet campaign initiated by a social hub we contacted, and 108 from a retweet campaign initiated by foursquare). Participants were placed in a raffle for three $75 gift certificates.

The majority of our participants were from the US (158), with Europeans (46) being the second largest group. Our participants were predominantly male (157, 72%), with 62 females (28%). The ages of participants were distributed as follows: 18-23: 26, 24-29: 77, 30-35: 69, 36-41: 23, 42-47:13, 48-53: 6, 54+: 5. Again, foursquare claims that the gender ratio of its users is close to 60% male and 40% female [9], so our participant pool was biased towards males.

Activity	Min	Max	Mean (stdev)	Median
Days Out	1	1136	138 (121)	401
Check-Ins	1	3310	578 (613)	613
Things Done	0	393	19 (40)	7
Badges	0	96	17 (13)	14
Mayorships	0	141	12 (16)	7
Friends	0	2250	65 (165)	34
Tips	0	104	8 (14)	3
To-Dos	0	350	5 (26)	0

Table 2. Participant activity on foursquare in Survey 2

The activity of our participants on foursquare at the time of the survey is shown in Table 2. We asked participants to log into their foursquare accounts, so they could view their profiles and report accurate data.

The majority of our participants (102) used an iPhone to access foursquare, with Android and BlackBerry as a distant second and third (46 and 39 respectively). The majority of our participants (143) had started using the service during the year 2010, while only 45 participants had used the services for 3 months or less. 67 participants had used the service since 2009, of which four had started using the service the same month it was launched. About a quarter of participants used other location sharing services, including Gowalla, Google Latitude, and Loopt.

Our survey started with a question "why did you initially join foursquare", and allowed to select multiple options from a randomized list. 94 started because of friends, 144 were just curious, 127 thought it sounded like fun. Interestingly, only 29 participants stated starting because of the possibility of getting discounts, and 33 listed also answered "Other", in which they included "promotion of business", "tracking spending" and "I think I was the first user in Austria ;)".

Why People Use foursquare

Based on our interviews and qualitative survey, we asked questions organized into 19 items on a 5-point Likert scale. We also presented other questions about usage that were not suitable to be asked as Likert scale questions and we present those findings later.

We used the principal components method with varimax rotation for exploratory factor analysis [28]. The purpose of this method is to find a small number of variables that account for most of the variance in the original items. By examining eigenvalues and scree plot, we concluded that five factors would represent the data sufficiently. The five factors represent 68% of the variance, and Cronbach's alphas clearly exceed the commonly used criterion of 0.7. We note that Factor 4 is only loaded by two variables, however, both variables substantially exceed the critical values for statistical significance. As suggested by Stevens [28] we considered values exceeding critical values: $2 \times 0.182 = 0.364$ for this sample size (~200), to be statistically significant. Application of these criteria led to identification of 5 factors, which we discuss below.

Factor 1: Badges and fun (Cronbach's alpha 0.87)		
Survey Item	Item Mean (stdev)	Loading
I pay attention to the badges that I earn	4.16 (0.93)	0.85
I pay attention to the badges that others earn	3.70 (1.08)	0.77
I am proud of the badges I have earned	3.94 (1.00)	0.86
I check in because I like getting badges	4.02 (1.00)	0.87
I think foursquare is fun	4.22 (0.73)	0.62
I consider foursquare to be a game I play with my friends	3.66 (1.06)	0.72

Factor 1, which accounts for the most variance overall, is clearly focused on badges, a novel innovation of foursquare's game aspect. The loaded items indicate that one's own badges as well as other's badges are important. Factor 1 also indicates that collecting badges contributes to the perceived fun of foursquare. It also emphasizes that foursquare is also a game you play with your friends and badges are a form of self-representation.

Factor 2: Social connection (Cronbach's alpha 0.88)		
Survey Item	Item Mean (stdev)	Loading
I use foursquare to let other people know that I am available to hang out.	3.48 (1.09)	0.66
Foursquare helps me keep in touch with my friends.	3.32 (1.10)	0.82
Foursquare is fun because my friends are using it.	3.67 (1.01)	0.77
I use foursquare to coordinate with my friends.	2.69 (1.08)	0.69
I often check into a place at the same time as my foursquare friends.	3.37 (1.20)	0.70
I pay attention to other people's check-ins.	3.74 (0.85)	0.53
I consider foursquare to be a game I play alone.	3.02 (1.20)	-0.46

Factor 2 is linked to social connections as well as different ways of using foursquare to interact with friends. Note also that there is significant negative loading with the item "game I play alone" in Factor 2. We discuss other aspects of social connectivity below, in particular meeting new people through foursquare.

Factor 3: Place discovery (Cronbach's alpha 0.87)		
Survey Item	Item Mean (stdev)	Loading
I use foursquare because I can get discounts and special offers.	3.30 (1.14)	0.5
I have found a good tip about a place by using foursquare.	3.74 (1.07)	0.71
Foursquare has motivated me to go to new places.	3.81 (1.06)	0.78
I have discovered new places from my use of foursquare.	3.68 (1.07)	0.82
I use foursquare to keep track of places I have visited.	3.90 (0.98)	0.40

Factor 3 is comprised of items that highlight foursquare's incentive mechanisms for frequently visiting and discovering new places. Note that the items "discounts and special offers" and "keep track of places" have substantially less loading than the other items, and the first item has also smaller item mean compared to the other items in the factor.

Factor 4: Keeping track of places (Cronbach's alpha 0.88)		
Survey Item	Item Mean (stdev)	Loading
I use foursquare to keep track of places I have visited.	3.90 (0.98)	0.73
I use foursquare because I can get discounts and special offers.	3.30 (1.14)	-0.62

Factor 4 is bipolar and loaded by only 2 items. It clearly indicates that keeping track of places does not overlap with the motivation for getting discounts and special offers.

Factor 5: Game with yourself (Cronbach's alpha 0.88)		
Survey Item	Item Mean (stdev)	Loading
I consider foursquare to be a game I play alone.	3.03 (1.20)	0.76
I pay attention to other people's check-ins.	3.74 (0.85)	0.43
I use foursquare because it gives me something to do when I am out.	3.49 (1.08)	0.39

Factor 5 shows that foursquare can also be used as a game you play alone, echoing a comment in the first survey: "just something to do when I'm bored". The second and third items do not heavily load the factor, though they do satisfy the statistical significance criterion established above. We speculate that foursquare might also have use for "eavesdroppers," people that don't check-in but desire to know where others are [15]. Foursquare's check-in off-the-grid feature allows this kind of "eavesdropping" without sharing check-ins with others, while still allowing playing foursquare as a game and collecting points.

Where People Check-In
We next examine where people check-in. Figure 1 shows a bar chart that displays frequency of logins for various places. Restaurants and bars are fairly popular places to check-in at. This finding is not too surprising, given the above discussion of the factor analysis.

Interestingly, most participants never check-in at a school. On the other hand, our participants were predominantly older than typical college students. Foursquare's demographics also differ from other social media, which have become popular first among young teens [7]. However, the lack of mobility among young teens and the relatively high cost of smartphones may account for this finding.

We also saw that most people do not check-in when seeing a doctor. More interesting, however, was the bimodal distribution of check-ins for home and work. Note that for homes, the majority of people say that they never check-in, but there are many people who check-in 1-2 times a day. Checking in at work has a somewhat similar distribution, with many people checking in 1-2 times a day.

Results from Survey 1 can account for this finding. There are many people who are concerned about privacy, and hence manage part of their concerns by never checking in at home. On the other hand, there are many people who are interested in gaining as many points, badges, and mayorships as possible, and check-in everywhere.
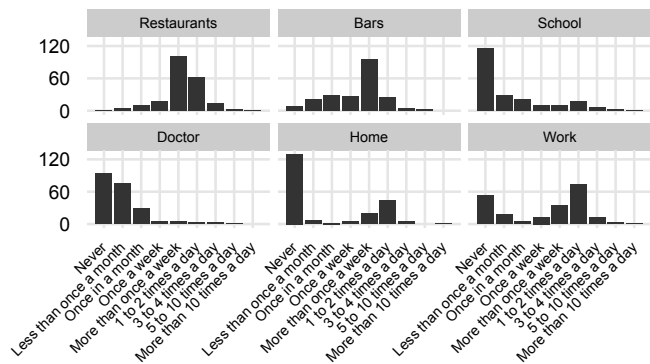

Figure 1. Distribution of how often users check in to a number of specific locations. "Home" and "Work" exhibit a bi-modal distribution.

Newcomers vs Longer-term Users of foursquare
In this section, we examine a few differences between people just starting to use foursquare versus those using it for a longer term. Note that foursquare was launched in March 2009, so longer-term use is a relative term here.

Figure 2 (Top) shows the relative effects of the five factors based on the number of days the participants have used foursquare. Recall, the number of days was obtained by asking to find the date of their first check-in in their foursquare profile. Also, this analysis is cross-sectional and does not show how an individual user's motivations change over time, but rather shows people in different stages of foursquare use.

Figure 2 (Top) shows an increase in Factor 1 in the first 200-300 days of use with a slow decline afterwards. Factor 1 is associated primarily with badges. This result suggests that badges are an important motivation for using foursquare initially but declines in importance over time. In contrast, Factor 2, which is associated with friends, and Factors 3 and 4, which are associated with places, steadily increase in importance over time. Factor 5, which is associated with the gaming alone aspect of foursquare, changes little over time. One possible explanation for these findings is that the novelty of badges wears off after prolonged use, but the social aspects, and the place discovery aspects of the service do not.

However, Figure 2 (Bottom) shows that Factor 1 is still an important motivator for using foursquare even after a person has many badges. This suggests that there are users to whom badges are a continual motivating factor. To a weak extent, this discrepancy might indicate a possible check-in fatigue after some of the novelty effects of foursquare have worn off. However, Figure 2 (Bottom) suggests that this is mitigated among users who are motivated to obtain many badges.

Managing Privacy in foursquare
We had several questions regarding privacy in foursquare. First, we will present an overview of the statistics, and then discuss some interesting findings. 163 (74%) participants had recognizable photos in their public profile, while only 10 had no photo and the rest 46 had a non-recognizable photo. Participants also shared contact information with their friends,
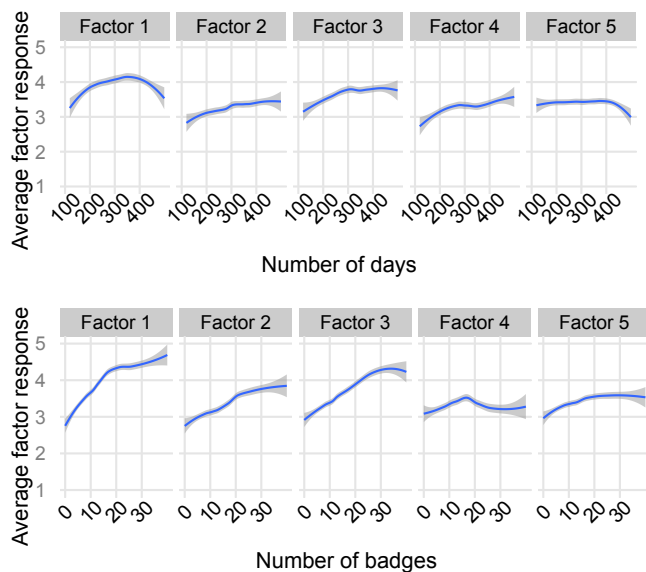
Figure 2. *Top*: Shows the average of survey responses for each factor as a function of how long the user has been using foursquare. *Bottom*: Shows the average of survey responses for each factor as a function of the number of badges the user has. Notice the diminishing importance of Factor 1 with respect to number of days, yet no such change occurs with respect to number of badges.

with over 70% of people sharing phone number, email address, or links to their Facebook or Twitter profile. The majority of participants (187) also allowed themselves to be seen in the "Who's here" listings and 193 let local business see that they had checked-in to a venue. 142 (64%) of our participants linked their foursquare account to Twitter, while 114 (52%) linked it to Facebook. However, only 40 participants (18%) tweet about their check-ins and even fewer 23 (11%) allow foursquare to post their check-ins to their Facebook walls. To some extent, this may be due to concerns about spamming their friends, as discussed in Survey 1.

Badges and mayorships are considered important enough to be broadcast to the world or shared with Facebook friends: 83 participants (38%) tweet about receiving mayorships and 98 (44%) tweet about receiving a badge, while 48 (21%) automatically post mayorships to their Facebook walls and 53 (24%) share receiving a badge.

We also saw a new finding we had not seen in the interviews or Survey 1. In Survey 2, 128 participants (58%) said they had friends that they had not met in person. This is a surprising finding, especially given that people have often expressed concerns about stalkers in previous research literature. One possible explanation of this finding is that people friend others who they see going to cool and interesting places, to help themselves find new places to go to. In this sense, these "friends" are more like followers in Twitter. Another possible explanation is that people are interested in just friending everyone, sort of as a display of popularity. In Survey 2, the average number of friends was 66.5 (stdev = 167.0), thus, there is no conclusive evidence.

Following up on the point about stalkers, we found only small evidence of concerns. In total, 9 participants expressed concerns about stalkers (7 male and 2 female). Again, this finding may be due to the fact that our participants are early adopters, but it also suggests that people felt in control of what was shared with whom.

We also saw further evidence of people checking-in for safety purposes. We probed this question in the second survey, and found that 29 of our participants (17 male and 12 female) sometimes check-in when they are leaving a place for safety purposes. A significant number of participants 71 (32%) also said they used foursquare to verify that someone has safely arrived at a destination.

Meeting New People Through foursquare
One aspect of location sharing applications that has not been much explored before in the scientific literature is meeting new people. Meeting new people is something that was mentioned by our interviewees and by participants of our first survey. This is not an unexpected use, but is something that can only now be studied due to the scale of foursquare.

66 (30%) of our participants had met new people with the use of foursquare and 3 participants had even used foursquare for the purpose of dating or developing a romantic relationship. 37 participants (17%) had gone to talk to new people and 30 participants (14%) have been approached by unknown people. These findings indicate that the "Who's here" feature can serve as a mobile social serendipity tool.

Although we have evidence that some foursquare users do indeed meet new people through the system, we did not probe these uses with Likert scale questions and therefore cannot compare them to factors described earlier.

DESIGN IMPLICATIONS
There are several design implications that we discovered. Clearly, designing a location sharing application as a game motivates users to share their location. Our study shows that foursquare users find utility in receiving more "points", be it in the form of check-ins on their public profile or new badges they receive. Further, having multiple value propositions seemed to be an effective strategy. It allowed users to start with badges and fun, and continue with social aspects as the users built their social network. Similar multi-value strategy have been seen, for example in Wikipedia [8], where rights and responsibilities grow with increased participation, although these tend to be more in the social structure of Wikipedia rather than in explicit features of the service.

Check-in services are particularly suited to address security and privacy issues in location sharing because user action is required every time information is shared. Systems that operate in this way can help with a variety of concerns. Furthermore, some privacy concerns arise from being at home or work. This suggests that it may be useful to treat residences differently than other places due to potential privacy risks, for example, by making places marked as "home" not publicly visible and limiting who can check-in to those places.

Even further, since 58% of our participants had foursquare friends that they had not met before, it would be useful to have an easy way to separate real friends from followers, for example, for enabling sharing some check-ins only to your real friends.

Finally, our results show that people have varying, even non-designed, uses that could be explicitly designed into future systems. Examples of these include checking-in for safety purposes and signaling availability when at home.

DISCUSSION

Through interviews and two different surveys, we examined how and why people use foursquare, as well as how people manage privacy concerns. We found many reasons as to why people use foursquare, including elements of fun, exploration, and coordinating with friends. From this perspective, foursquare is succeeding in its stated design goals.

We also saw some uses of foursquare that are well aligned with the existing research literature. These uses include, for example, signaling availability to friends, using the history of places you go as a form of presentation of self, and coordinating with friends.

We also found some unexpected uses of foursquare, for example people who were very active in the gaming aspect of foursquare and would check-in at other people's homes, as well as people who used foursquare with safety in mind or for safety purposes, either by checking-in as they were leaving a place, or checking-in when they arrived at a place.

Somewhat surprisingly, the majority of users had few privacy concerns. This can be expected, because the participants of our studies have already chosen to adopt foursquare, thus, there is a sample bias. However, given the large numbers of people who have signed up for foursquare, we now have more insights into the range of privacy concerns people have with a large-scale location sharing application, as well as into how they manage these concerns.

The most obvious way of managing one's privacy is choosing not to check-in to a place. In our studies, we saw that people chose not to check-in to places for several reasons, including places that they would be embarrassed to be seen at (e.g. fast food restaurants), places that they felt were not interesting or often visited, and places perceived as sensitive (their own home or other people's homes). Some people also opted not to connect their foursquare account to other social media sites, and for those that did, some chose not to broadcast every check-in, possibly due to a desire not to spam their friends with updates.

Surprisingly, we found that over half of our participants had people that they didn't personally know as foursquare friends. We speculate that these "friends" are more like Twitter followers, and are simply interested in knowing where interesting people go. It is not clear to us whether the other half of participants simply refused these kinds of connections.

Limitations and Further Work
The self-reporting nature of our studies is a fundamental limitation. For example, if we would have access to histories of foursquare users, we could draw usage patterns that are not possible with survey data. Our quantitative analysis is also limited by the findings of the qualitative studies: if we did not capture a usage of foursquare, our second survey would not probe into it. Further limitations come from the self-selective nature of our users: in interviews we received our participants from advertisements on social network cites, in survey 1 mostly through craigslist postings and in survey 2 mostly through Twitter re-tweets.

It is also an open question how well foursquare users manage their privacy compared to how well they think they manage it. It may be that users perceive themselves as consciously managing their own privacy, while having concerns that others do not, as seen in previous studies about Facebook [13]. It may also be that some users are simply unaware of potential risks, like the ones presented by pleaserobme.com.

Finally, we studied only foursquare, which is still a rapidly evolving service. This may limit the generalizability of our findings. We captured a snapshot of early adopters and presented results of why and how they use foursquare, and how they manage privacy concerns. When foursquare is adopted by early majority and late majority users [26], we maybe able to see different patterns of use and concerns. For example, we did not find that discounts and special offers would be a strong motivator for checking in, but if more businesses adopt foursquare as well, this factor could change.

CONCLUSIONS
We presented the results of three user studies of foursquare. The first study was a series of semi-structured interviews to understand the uses of location based services. Informed by this study, we chose to probe how and why people use foursquare, a popular social-driven location sharing application, through a classic two-part survey study. In particular, we focused on what motivations people had for using foursquare, where they used foursquare, some comparisons of newcomers vs longer-terms users, and how people managed privacy concerns.

Our findings support those of past studies of location sharing applications, and also introduce some new findings regarding surprising uses as well as how people manage their privacy. The results of our paper can inform the design of social software, and also offer some insights into how to build better mobile social applications.

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