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

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## ABSTRACT

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

## Author Keywords

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

## ACM Classification Keywords

H.5.2 Information Interfaces and Presentation: Miscellaneous

## General Terms

Human Factors, Design

## INTRODUCTION

For the past twenty years, researchers have investigated a wide range of location-sharing applications. With the increasing diffusion of GPS and Internet enabled smart phones, many of these early research ideas are finally being adopted by consumers.

Using the terminology of Tang et al.[25], we can broadly categorize location-sharing applications as either purpose-driven, where people explicitly request another persons current location (e.g. Glympse, Google Latitude, Loopt, 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 August 2010, foursquare claims to have over 3 million members [9]. This critical mass of users finally provides researchers an 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 [9]. Both its popularity and that of other location services raise many questions: What value drives peoples 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 about real-world usage and can reveal design opportunities for new services and new applications.

The research literature for many years has found that privacy has been 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 insights into this issue, 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 separate studies examining location-sharing applications: (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 examine how and why people use foursquare, both qualitatively and quantitatively. Minor contributions here include identifying surprising uses of foursquare, investigating where people check-in, differences between newcomers and longer-term users of foursquare, and using foursquare to meet new people. Second, we investigate what privacy concerns peo-

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ple have and how they manage those concerns. We found some new issues with respect to location privacy, and 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 [9]. Foursquare has custom clients for smartphones such as iPhone, Blackberry, Palm, and the Android platform.

Foursquare lets people add 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 users current location and shows a list of nearby places. Users can also add new places.

When a user checks in to a place, the default is to have the check-in be 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, where 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. Foursquare users that have checked-in to a place can see who else has recently checked in. 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 ones public profile. Badges are awarded for a variety of reasons, e.g. starting to use the service, checking-in on a boat, checking-in with 50 people at the same time, or checking-in in 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 stores offer discounts for people who are mayors of a place, for example a caf offering a coupon. 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 a SMS-based service that required users to check-in to see others check-ins, and was limited to major cities. Humphreys reports on a set of interviews with Dodgeball [12], finding that Dodgeball provided mobile social connectivity and possibilities for ca-

sual social congregation. However, in contrast to foursquare, Dodgeball didn't have game mechanics and other incentives to check-in integrated to the system, and only offered limited information about people's check-ins due to limitations of SMS.

Ludford et al. studied peoples willingness to share their locations in Sharescape [19], 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 [15]. 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 [3] 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 [11] also let people annotate place names by reporting their location using SMS messages 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 the purposes of social matching [8].

In this paper, we studied the uses and gratifications of foursquare, basing our work on a classic two-part procedure established in marketing research [6]. Our work also contributes to the research communitys increasing understanding of how and why people use social media (for example, [1,14,17,27]). 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 [13]. 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 [10,16,24]. Our work is more closely aligned with studies on privacy with location sharing applications. Past work has examined many aspects of this problem. For example, some projects have examined how people set privacy policies [20,26]. Other work has examined what people would share and with whom [7,18], studies of deployed research systems [3,22], and studies examining the differences between purpose-driven request-based systems and social-driven broadcast systems [25]. Our work builds on this rich literature and contributes new findings on privacy concerns in a widely deployed system, as well as how they manage their privacy.

## INTERVIEWS WITH EARLY ADOPTERS OF LBS

We started this line of research by investigating location-based services broadly. Specifically, we wanted to understand what location-based services people used (outside of navigation), what value they found in these applications, and instances of appropriation. These interviews helped inform two later surveys. Towards this end, we conducted semi-structured interviews with 6 early adopters of location-based services, comprised of 4 men and 2 women ranging in age from 21 to 38. We refer to these participants as A1 A6. We recruited participants through online postings, 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 location-based services. Participants had been using their iPhones for an average of 7.9 months.

Our participants used a number of location-based applications, the majority of which were location-sharing applications, including BrightKite, foursquare, and Loopt. Other applications included those for finding shops and restaurants, such as Yelp and Urbanspoon, and travel planning applications such as TripIt and Dopplr.

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. We encouraged the participants to talk freely about any aspect of these systems. Following each interview, we summarized the content, identifying the ways they used their location-based applications and drawing out unexpected uses. After completing the interviews, we examined the summaries and identified crosscutting themes.

### Interview Findings and Themes

Although we had a number of findings, we focus only on 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 location 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 has 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 go to the trouble. A5 had a very different take, saying his significant other was the only person that routinely checked in, but that 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 Im 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 didnt 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 reasons 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 was only recently released. 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 the day after one of her friends and seeing that he had checked in there the day before. A5 describes following his friend as she 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 is an interesting place to check-in, the destination airport is 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 makes it a point not to check-in when arriving at some privacy places, such as a friends apartment. Her reasoning is that, while she does not mind if one of her contacts knows she is at the apartment, she wants to protect her friend by not revealing the location of the apartment to others, who may or may not have access to that information otherwise.

**At large events** - A3 recalled being at the South-by-Southwest (SXSW) conference where foursquare was first announced. He said he checked in everywhere, much more frequently than he does 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 where he was, in case they wanted to meet up.

## SURVEY 1: QUALITATIVE EVALUATION OF FOURSQUARE USE

From the interviews, we saw several repeated themes 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.

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. Survey 1 participant activity on foursquare**

We chose to probe these issues more deeply, focusing on foursquare, since it had a large set of active users. Towards this end, we conducted two rounds of surveys. We modeled this approach on uses and gratification studies in marketing research [6], though we did not restrict our questions and analyses to just uses and gratifications. 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 discuss the first survey below.

### Method

We solicited users through craigslist postings and flyers at our university. 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. In the survey 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 but excluded 7 for discrepancies between their survey answers and their public foursquare profile. Of the 18 remaining participants, 9 were female and 9 were male, which is a reasonable distribution since foursquare claims that their male-female ratio is close to 60%-40% [5]. 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.

### Results and Discussion

The participants activity on foursquare is depicted in Table 1.

#### *Foursquare Design Goals*

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

For example, many people mentioned friends as the main benefit, in terms of sharing with friends where they are going and what they are doing. A few people 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. A few people mentioned fun, though interestingly, others described foursquare as just something to do, especially when bored. Several people mentioned earning points, badges, and mayorships as motivation for participating.

Discounts were mentioned by many of our participants. A few people mentioned tips from other users as being 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 flashlight by showing the badge at a specific booth. Participant B6 remarked that foursquare benefits 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 study 1 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. Our fourth question focused on privacy. Since privacy featured strongly in the third question, we combine the discussion of these two questions below.

Many participants mentioned privacy as a drawback. There were the usual concerns about stalkers and strangers. However, when asked more specifically about their privacy concerns, many 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 foursquares 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. Other participants didnt link to Facebook or Twitter and therefore didnt have concerns. Participant B15 also said she didnt have concerns because she didnt share every check-in. Two participants went even further and stated that if you have privacy concerns you shouldnt 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 men-

tioned 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 see her location would nevertheless be able to do so.

#### *Why People Don't Check-In*

People had many interesting and surprising reasons for deciding not to check-in. Self-representation issues also emerged, as it has for other location-sharing systems [7,20,22,26]. For our participants, one surprising form of self-representation was choosing not to 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. Some people 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 same 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 certain 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 will show that there are also people who actively check-in to these locations.

#### *Surprising Uses of Foursquare*

Some participants also mentioned new uses of foursquare that were not part of foursquare's explicit design goals, and have not been strongly documented in previous research literature.

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.

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 an ESM study by Anthony et al [2] suggesting that people wanted to share their locations when they were bored and wanted to be with friends.

A few people said that they checked-in to their own home and friends' homes because they wanted to become mayor of that location. One person 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' homes (who also used foursquare) because they don't check-in at home.

These check-ins at people's homes introduce potential physical security risks. The web site [pleaserobme.com](http://pleaserobme.com) pushed an awareness campaign in 2010 about how check-in services and certain kinds of tweets make it easy for criminals 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 here 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. This tension suggests possible design opportunities, for example, making places marked as home not publicly visible, limiting who can check-in to those places, or offering other signals of availability.

## **SURVEY 2 QUANTITATIVE EVALUATION OF FOURSQUARE USE**

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 our university, advertising on online message boards, asking people to share on Facebook, and through Twitter. Foursquare also helped advertise our survey. Participants were placed in a raffle for three \$75 gift certificates.

The majority of our participants were from the United States (158), with Europeans (46) being the second largest group. Our participants were predominantly male (157, 72%), with

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. Survey 2 participant activity on foursquare**

62 females (28%). The age of participants were distributed as follows: 18-23: 26, 24-29: 75, 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 [5], so our participant pool was biased more towards males.

Our participants activity on foursquare at the time of the survey is shown in Table 2. We asked participants to log into their foursquare account, so as to get 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 them 4 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 listed options in randomized order. 94 started because of friends, 144 were just curious, 127 thought it sounded like fun. Interestingly, only 29 participants claimed 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 as 19 categories on a 5-point Likert scale. We also presented other questions of usage that were not suitably asked as Likert scale questions and we present those findings later.

We used the principal components method with varimax rotation for exploratory factor analysis [23]. The purpose of principal components is to find a small number of variables that can account for most of the variance in the original items. By examining eigenvalues and scree plot, we ended concluding that five factors would represent the data sufficiently. The five factors represent 68% of the variance, and Cronbachs 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

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

**Table 3. Factor 1: Badges and Fun (Cronbach's alpha 0.87)**

critical values for statistical significance. To evaluate statistical significance, we used as critical values as suggested by Stevens [23]: 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.

The first factor, which accounts for the most variance overall, is clearly focused on badges, a novel innovation of foursquares game aspect. The loaded items indicate that ones own badges as well as others 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 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 game I play alone with Factor 2. We discuss other aspects of social connectivity below, in particular meeting new people through foursquare. Factor 3 is comprised of items that highlight foursquares incentive mechanisms for frequently visiting and discovering new places. Note that discounts and special offers has less loading and smaller mean than other items (except for keeping track of places).

Factor 4 is bipolar and loaded by only 2 items. It clearly indicates that keeping track of places doesnt share a motivation with getting discounts special and offers.

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 Im bored. Foursquares privacy mechanisms support this by allowing check-ins off-the-grid. 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 dont check-in but want to know where others are [12]. Foursquares check-in off-the-grid feature allows this eavesdropping and still play it as a game without sharing check-ins with others.

### 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. This finding is not surprising given the previous discussion

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

**Table 4. Factor 2: Social connection (Cronbach's alpha 0.88)**

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

**Table 5. Factor 3: Place Discovery (Cronbach's alpha 0.87)**

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

**Table 6. Factor 4: Keeping track of places (Cronbach's alpha 0.88)**

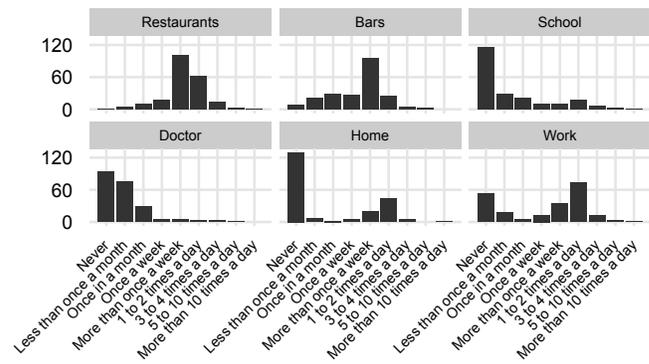
Survey Item	Item Mean (stdev)	Loading
I consider foursquare to be a game I play alone.	3.03 (1.20)	0.76
I pay attention to other people's check-ins.	3.74 (0.85)	0.43
I use foursquare because it gives me something to do when I am out.	3.49 (1.08)	0.39

**Table 7. Factor 5: Game with yourself (Cronbach's alpha 0.88)**

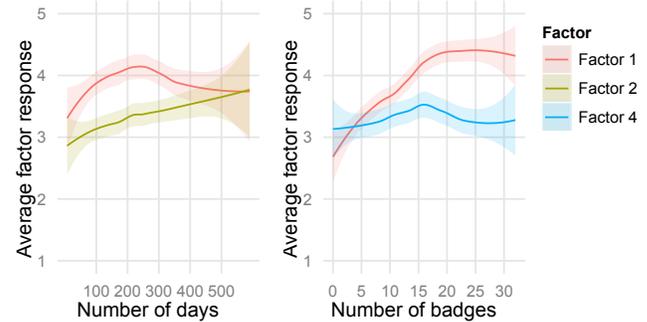
of principal components.

Interestingly, many people say that they never check-in at a school. To a large extent, this is because our participants were predominantly older than typical college students. The demographics of foursquare also differ from other social media, which tend to become popular first among young teens [28]. 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. This may be due to privacy reasons. More interestingly, however, is 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 some-



**Figure 1. Figure 1: Distribution of how often users check in to a number of specific locations. Notice that "Home" and "Work" exhibit a bi-modal distribution. Interestingly, many people say that they never check-in at a school. To a large extent, this is because our participants were predominantly older than typical college students. The demographics of foursquare also differ from other social media, which tend to become popular first among young teens [28]. However, the lack of mobility among young teens and the relatively high cost of smartphones may account for this finding.**



**Figure 2. Figure 2: Left: Compares the strength of Factor 1 and Factor 2 responses with respect to how long the user has been using foursquare. Right: Compares the strength of Factor 1 and Factor 4 responses with respect to the number of badges the user has. Notice the diminishing response to Factor 1 as it changes over time, yet no such change occurs with respect to an increase in badges.**

what 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.

### Foursquare Usage of Newcomers vs Longer-term users

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 2a (left) shows the relative effects of the factors based on the number of days people used foursquare. Again, the

number of days was obtained by asking people get this number from their foursquare account. Also note that this analysis is cross-sectional and does not show how an individual users motivations change over time, but rather shows how people in different stages of foursquare use self-reported.

Figure 2a shows an increase in Factor 1 in the first 200-300 days of use with a slow decline afterward. 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, steadily increases over time. One possible explanation is that people eventually run out of places to explore, making points and badges less appealing. Another possible explanation is that the novelty of points and badges wear off after prolonged use, but the social aspects do not.

However, Figure 2b shows that Factor 1 is still an important motivator for using foursquare even after a person has many badges. Thus, Figure 2b suggests it is usage over time rather than a large number of badges (i.e. going to new places), that leads people to feel that foursquare is less fun. To a weak extent, this indicates possible check-in fatigue after some of the novelty effects of foursquare have worn off.

As such, Figure 2 suggests an intriguing design strategy for social software: offer people multiple explicit reasons for using the system, with some reasons being stronger in initial use, and other reasons being more useful in continued use. Similar strategies have been seen, for example in Wikipedia [4], where rights and responsibilities grow with increased participation, though these tend to be more implicit in the social structure rather than explicit in features.

### Managing Privacy in Foursquare

We probed a number of 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, 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 to be seen in the Whos here listings and 193 lets local business see are they 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 less 23 (11%) allow foursquare to post their check-ins to their Facebook walls. To some extent, this may be because of the concerns about spamming their friends, as discussed in Survey 1.

Badges and mayorships are though 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 as going to cool and interesting places, to help them 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), so there is not 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 check that someone has safely arrived at a destination.

### Meeting New People Through Foursquare

One aspect of location-sharing applications that has not been deeply explored before in the scientific literature is meeting new people. Meeting new people is something that was mentioned both 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 approach by unknown people. These findings indicate that foursquares Whos here feature can serve as a mobile social serendipity tool.

While we have evidence of 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.

### DISCUSSION

Through interviews and two different surveys, we examined how and why people use foursquare, as well as how people manage privacy concerns. Qualitatively, 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. The game aspects of foursquare in particular seem to be very popular in early usage of foursquare, with social features increasing in importance over time. Again, this sug-

gests that having multiple value propositions for users, each of which may appeal to people in different stages of use, may be an effective strategy.

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 peoples homes, as well as people who used foursquare for safety purposes, either by checking-in as they were leaving a place, or checking-in when they arrived at a place safely.

More surprisingly was that the majority of users had few privacy concerns. Obviously, there is sample bias here, in that participants of our studies have already chosen to adopt foursquare. However, given the large numbers of people who have signed up for foursquare, we now have more insights as to the range of privacy concerns people have with a large-scale location-sharing application, as well as how they manage these concerns.

The most obvious way of managing ones 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, and places perceived as sensitive (their own home or other peoples 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 didnt 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 if the other half of participants simply refused these kinds of connections. One possible design implication is to segregate friends into two categories, separating close friends from followers that can only check-ins to public places (e.g., not home or work).

It is also an ongoing question as to how much privacy users have. It may be that users perceive themselves as consciously managing their own privacy, while having concerns that others do not [10]. It may also be that some users are unaware of potential risks, like the ones presented by pleaserobme.com.

Finally, foursquare is still a rapidly evolving service. We captured a snapshot of early adopters and presented results of why and how they use foursquare, and how they manage privacy concerns. As foursquare is adopted by early majority and late majority users [21], it is possible that we may see different patterns of use and concerns. For example, we did

not see discounts and special offers as a strong motivator, but if more cafes and restaurants adopt foursquare, this factor could change.

## CONCLUSIONS

In this paper, we presented the results of three user studies. The first study was a series of semi-structured interviews to understand the range of use 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 two survey studies. 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 offers some insights into how to build better mobile social software.

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