

Playfulness and Progression in Technology-Enhanced Social Experiences between Nearby Strangers

Susanna Paasovaara

Kaisa Väänänen

Tampere University of
Technology, Finland
susanna.paasovaara@tut.fi
kaisa.vaananen@tut.fi

Aris Malapaschas

University of Glasgow
Glasgow, United Kingdom
Aris.Malapaschas@glasgow.ac.uk

Ekaterina Olshannikova

Thomas Olsson

University of Tampere
Finland
Ekaterina.Olshannikova@uta.fi
Thomas.Olsson@uta.fi

Pradthana Jarusriboonchai

University of Lapland,
Rovaniemi, Finland
pradthana.jarusriboonchai@ulapland.fi

Jiří Hošek, Pavel Mašek

Brno University of Technology
Czech Republic
hosek@feec.vutbr.cz, masekpavel@feec.vutbr.cz

ABSTRACT

Encouraging social experiences and interactions between nearby strangers has received both research and commercial interest over the past years. This paper focuses on two design qualities that have previously been found successful in this area: *playfulness* and *progression*. Employing the research through design approach, we explore these as design principles in so-called people-nearby applications. To evaluate how playfulness and progression contribute to encouragement of social interaction, we carried out a field trial with Next2You, a playful mobile application that automatically detects nearby users and exchanges user-generated profile information. The results imply that the application features demonstrating playfulness and progression did contribute to encouragement of interaction between nearby strangers; however not as expected. The results provide a basis for reconsidering appropriate design decisions and methodological choices with respect to design and evaluation of people-nearby applications that aim to encourage interaction between strangers.

Author Keywords

Proximity-based interaction; people-nearby applications; collocated interaction; nearby strangers; social interaction; mobile application; field trial; research through design.

ACM Classification Keywords

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

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Permissions@acm.org.
NordiCHI'18, September 29–October 3, 2018, Oslo, Norway

© 2018 Association for Computing Machinery.
ACM ISBN 978-1-4503-6437-9/18/09...\$15.00
<https://doi.org/10.1145/3240167.3240212>

INTRODUCTION

Current mobile technology is primarily designed for connecting users with distant others and is thus often suboptimal when considering social interaction between collocated people. For example, people unintentionally ignore familiar others when they focus on using their devices, but also use them to intentionally create a private bubble to separate them from the surrounding crowd of strangers [8]. To amend this often socially disruptive role of mobile devices, researchers have envisioned that mobile technology could be designed to *encourage* social interaction—even between nearby strangers (e.g., [2], [14]). Research interest in encouraging social interaction between any nearby people, not just familiar ones, has been motivated by, for example, reducing social isolation and increasing civic participation and mutual awareness [26, 22]. Conceptually, technology-supported interaction between strangers falls under People-Nearby Applications (PNA), i.e., social matching systems that allow strangers to connect in real time based on geographical location [7]. The ubiquity of mobile devices equipped with capabilities to detect nearby devices provides an opportune technical platform for developing PNAs.

Prior user research on PNAs—either commercial applications or research prototypes—has discovered positive attitudes towards the fundamental underlying concept [1, 14]. User experiences of *curiosity* and *playfulness* often feature in the reported user study results [27, 21]. However, the research area is missing detailed analysis of the features and qualities that would contribute to creation of social experiences and new social encounters. Many central research questions remain unanswered, for example: what type of awareness of others can trigger an initial step of interaction? How to encourage people to advance from technology-mediated interaction to face-to-face interaction?

In addition to applications that are intentionally designed as PNAs, recent research has also studied commercial systems

that indirectly enable interaction between nearby strangers, e.g., Nintendo StreetPass [33] and Pokémon GO [32]. Research on StreetPass, the proximity-based social feature on Nintendo 3DS handheld gaming devices, has discovered that automatic exchanges of game data between nearby strangers have provided positive game experiences as well as positive social experiences, with high user retention [18]. Research on Pokémon GO has also discovered a wide variety of social interactions around the game [14, 19]. This raises the question of how such applications where the encouragement of face-to-face interaction is not the main aim can be so effective in reaching this design goal.

The above-mentioned commercial systems feature two general design qualities that contribute to the positive social experiences and interaction. First, *playfulness*, demonstrated as playful atmosphere and rewards, separates StreetPass from the more purpose-oriented social matching, making it casual and rewarding to take part in social interaction. In Pokémon Go, a similar ludic atmosphere, coupled with location-based playing, was found to support the emergence of various ad hoc social encounters and collaborative gaming amongst groups of strangers [16]. Second, *progression* refers to incremental advancement of the interaction from light-weight, low-barrier interaction towards more highly engaging interaction (e.g., in StreetPass, first becoming aware of others through automatic exchange of content, then engaging in technology-mediated interactions, and finally possibly engaging in a face-to-face encounter). In Pokémon Go the progression is less explicit: features related to teams and Gyms allow that the players identify each other as players of the game, and the inherent asymmetry of information between the players motivates them to approach each other also in the physical realm. We assume that *progression* can create curiosity towards and awareness of other users as well as facilitate new encounters by decreasing the social barriers for initiating interaction.

The aim of this study was, first, to design novel manifestations of these two design qualities, playfulness and progression in the design of people-nearby applications and, second, evaluate how the designed features contribute to social experiences and encourage social interaction between nearby strangers. Following the research through design approach [29], a mobile application called Next2You [30] was designed and implemented with a well-thought set of features. Next2You (N2U) automatically exchanges user-generated content between nearby strangers when users get to physical proximity to each other. While the overall application concept has been presented earlier [16], the present work focuses on describing the design from the perspective of the two qualities, as well as evaluating the user experiences with regard to application features relevant to the two design qualities. To this end, we conducted a seven-week trial study with altogether 162 users.

The contribution of this paper is three-fold: (1) we present novel design solutions with regard to playfulness and

progression as featured in Next2You; (2) based on an extensive trial study, we present an analysis of the social experiences and interactions resulting from such design; (3) we present considerations for designing mobile applications and evaluation trials for PNA focusing on encouraging interaction between nearby strangers.

RELATED WORK

Research and commercial efforts on designing mobile technologies to support socialization between nearby people have been ongoing for about two decades. Some of the work focuses on supporting socialization between nearby friends and some has a clearer focus on nearby strangers. While many research prototypes have demonstrated concepts from technical perspectives, also the users' experiences and user behavior with these systems have been studied. We present a selection of related systems, showing how they relate to the focus of our work, the design qualities of *playfulness* and *progression*.

Discovering nearby users of the same systems is one of the key elements of people-nearby-applications. Lovegety is an early example of a commercial proximity-based device designed for dating purposes. It revealed users with matching dating preferences within five-meter range by playing a sound alarm and a flashing light. Hundreds of thousands of devices were sold in just few months in late 1990's [9]. Hummingbird aimed to increase awareness of nearby group members by playing a humming sound when their devices were detected within 100 meter range [6]. Jabberwookies [20] would capture and present visually information about the nearby presence of other similar devices, thus contributing to the awareness of familiar strangers; we consider this as the first level in the *progression* of social interaction.

In addition to these simple devices, earlier research concepts and prototypes have experimented with exchanging different kinds of content between nearby stranger users, i.e., technology-mediated interactions that we see as the second level of *progression*. Some systems have required users to initiate a search for nearby users e.g. [11], while others do it automatically notifying users of the discovered users [3]. In tuna [1] and CapitalMusic [23], the social experiences were to arise from sharing song choices. DigiDress [21] and Scent [11] included sharing identity expressions with textual and picture content. Challengz [17] aimed to create social experiences in form of nearby strangers contributing to shared video stories. TWIN [27] allowed file sharing between nearby users. In many of these research cases, the content is aimed to be consumed at that instant, for instance by connecting with the discovered user to listen to the music they play [1] or to fetch their digital identity expression [21]. Automatically collecting and accumulating content from nearby users has not been researched as a key element of design. Automatically collected avatars play an essential role in Nintendo StreetPass [33] design but there the emphasis is on the game benefits the collected profiles provide. The

findings from StreetPass users' experiences [18] point out that in addition to the game benefits, StreetPass provides social experiences, which motivates further research explorations related to collecting playful content in physical realm without the game benefit.

Recent mobile dating applications, e.g. Tinder [34] and Happn [30], use user's location as a part of their matching process. There the concept of 'nearby' spans from being located in the same city to having visited the same place at the same time. Dating applications often emphasize profile pictures, showing promise of one's appearance [4], and finding automatically matches in users' interests. In addition to dating, mobile social matching applications can be used for making new social connections for friendly and professional purposes. Previous research has explored for example looking for matches between users' contact lists to infer a common ground [12], and looking for common interest to give tickets-to-talk [10]. Promising results have been found about using simple wearable devices to infer a nearby match in professional events [2]. In contrast to social matching and dating applications, our research explores whether users can be motivated to interact with nearby strangers upon encounters in physical realm with a design based on *progression* and *playfulness*, without the knowledge of compatibility and under an illusion of anonymity. Dating application profiles have been lately designed for immediate approval or dismissing of the suggested matches [13], whereas progressive disclosure of information upon encounters in physical realm has not been explored.

Research has shown that users of existing commercial people-nearby-applications have an inherent motivation to meet others offline [7] and have different strategies to building trust before taking these online connections with strangers to offline meetings. Profile pictures and online discussions as well as crosschecking other online profiles play a role in that. StreetPass design instead limits communication between users. We saw that the role of technology-mediated communication in playful interactions between nearby users is not yet understood.

Previous research features several studies reporting that use of the studied prototype has led to face-to-face interactions [1, 21, 27, 2], which we consider as the last step of *progression*. The reports are, however, vague on how the different features contributed to the face-to-face meetings.

The evaluations of previous research prototypes have been mostly short term or small scale, often remaining on concept evaluation level. Many small-scale studies have been conducted by controlling the circumstances so that the few concurrent users encounter each other. In such evaluations, the novelty effects related to new technology affect the reliability and generalizability of the findings. As the early solutions like Hocman [5], the social application for traffic encounters between motorbikers, and the social music application tunA [1] required specific hardware, they were

evaluated with less than ten users. Later on, mobile phones allowed user studies to be conducted with participants' own phones as part of their everyday activities. Such long-term, in-the-wild field trials are rare exceptions, leaving the true potential and problems undiscovered. The notable exceptions of field trials are DigiDress [21], Scent [11] and TWIN [27], each having hundreds of users over months. Even though DigiDress and Scent were successful at the time within the corporate setting of the field trial, the commercial product created based on the research was not successful. Their success can partly be explained by the novelty of having even some kind of an application in the phone. Today's mobile applications have to compete of user's attention together with thousands of other applications making the applicability of the same design decisions questionable.

THE DESIGN OF NEXT2YOU

The overall design goal of N2U is to create social experiences between nearby strangers and encourage technology-mediated and face-to-face interaction between them. Its target users are especially people that are often within close proximity to each other but not necessarily have interacted before, i.e., *familiar strangers* [20]. As the application concept and implementation of N2U have been reported in [16], in the following we summarize the key features, particularly considering the design of *playfulness* and *progression*.

N2U automatically exchanges pieces of profile information between users that are within Bluetooth range from each other. A background process handles the exchanges, and the user gets a notification upon such event. The profile of a user consists of user-created snippets of information in textual form (called "*whispers*", referring to the idea that only people close enough may obtain them), as well as a profile picture which is by default hidden from other users.

Designed to encourage the creation of content, N2U proposes each user to create at least three whispers as part of profile creation. Also, N2U requires exchanging at least one whisper before any further interaction, i.e., sending personal messages or registering face-to-face meeting with other users can happen. Exchanges are reciprocal: one can receive only as many whispers from others as they have shared themselves.

Nearby users' avatars are highlighted in the main view (see Figure 1), which is expected to increase the awareness about others and curiosity towards them. Users' privacy is protected by revealing only their presence in the proximity, not their location. Furthermore, users can freely decide what and how much they share about themselves in their whispers. Building trust before face-to-face meeting can happen through personal messages. In case of misbehavior, the user can block another user to remove the exchanged content and to prevent any further discovery.

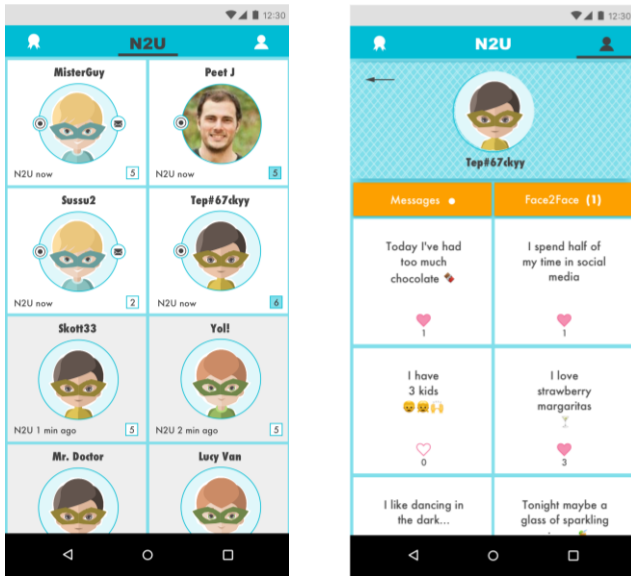


Figure 1. N2U main view and profile of an encountered user.

Progression in N2U

The design principle of *progression* relates to two different aspects. Firstly, each encounter with the same person reveals a new whisper, allowing one to discover the profile of that person progressively. Here, an *encounter* refers to the fact that two users have been in close proximity, regardless of whether they interacted or not. As the profile information accumulates over several encounters (see Figure 1), the risk of sharing too much in any one encounter is decreased. In this way, progression has a dual function of both motivating exploration and preserving privacy. Furthermore, the user can define the order in which the whispers are revealed one after another.

Secondly, the design provides possibilities and encourages users to progress from the mere awareness of nearby others to learning about them by reading the whispers, further to interacting with them with likes and personal messages in the application, and finally in a face-to-face setting. Liking is aimed to provide a low-threshold form of interaction. The knowledge gained from collected whispers could provide tickets to talk, while personal messages allow discussion on them or agreeing to meet.

Playfulness in N2U

Playfulness is an overarching design principle manifesting in the application design in several ways. One central element in the design is collecting, in this case, other people who have been nearby. The main view of the application is empty in the beginning. By encountering other users in proximity, their representations are collected in the main view. Each encounter collects a new whisper from the other user and adds to the counter of how many times they have encountered each other.

Playfulness of created content, i.e., whispers, is supported by providing predefined sentence starters e.g. “My superpower is”, “I dare you to” and “Did you know that”, but also leaving

the freedom to create the whole sentence from scratch. Users can furthermore take advantage of the emoji provided by their mobile device operating system. Our choice of textual content allows user generated playfulness in a way that requires minimal effort in creation phase, however being descriptive and understandable (cf. photos or videos).

Playfulness was also implemented in terms of gamification, achievements in particular. Achievements could be earned in eight different categories representing the different actions enabled by the application, and each category comes with four levels of increasing demands. This aimed to motivate the users to actively use the system and encourage them to interact with other users on different levels, e.g. collecting profiles, liking whispers, sending messages, having face-to-face meetings.

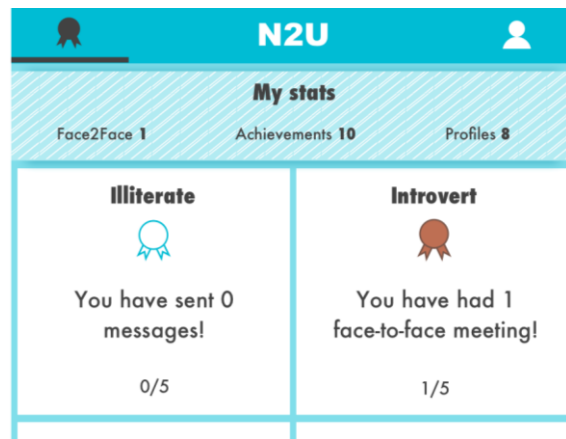


Figure 2. Excerpt of the list of achievements in N2U.

Encouraging face-to-face meetings was associated with two further playful aspects. The identities of other users remain a mystery as their profile picture is replaced with an avatar wearing a mask; the profile picture is revealed only as a reward of registering a face-to-face meeting with the given user. The number of revealed profile pictures would thus signify user’s social activity as another type of collectable achievement. Registering a face-to-face meeting can be done by going successfully through a playful sequence of selecting correct avatars requiring both users to see each other’s displays. The feature is available only when the two users are detected in proximity of each other.

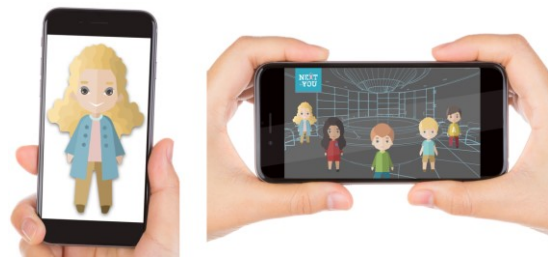


Figure 3. Registering a face-to-face meeting.

FIELD TRIAL

To evaluate the effectiveness of our design in a realistic setting, we organized a field trial with 162 voluntary participants that started to use the application over a period of seven weeks. The aim of the field trial was to investigate the overall user experiences of our research artifact N2U, and the social experiences that emerge from using it. In particular, our goal was to understand how the features manifesting *playfulness* and *progression* contribute to this.

Study Setting

The field trial was arranged in spring 2016 at two university campuses: Tampere University of Technology and Brno University of Technology. Both campuses are geographically relatively restricted and densely built, creating an opportune context for users to encounter each other. As the application is proximity-based, there was no interaction between the users at different campuses. The two sites provided a practical opportunity to increase the number of participants; however, our intention was not to compare the results between the two sites.

The possibility to take part in the trial was promoted in university classes, through mailing lists and websites, on paper posters and flyers. There were also two Facebook groups, one for each campus to promote the user trial already in advance. There was no reward given to every participant but several prizes were announced to be raffled among all participants.

To minimize the need for personal meetings with the trial organizers and thus better enable for a large-scale trial, the application was available for downloading in Google Play [31], and all the necessary instructions, tutorials and the research consent form were incorporated directly into the application.

Data Gathering

We gathered research data in several ways during the trial. When installing the application, the users first gave an informed consent to take part in research and analysis of their data, and then provided the following details about themselves: gender, age, campus, membership (student, staff, other), and e-mail address.

The interactions between users as well as the content of the created whispers were analyzed from server-side log files by importing necessary information to Excel sheets and processing them manually. The non-English whispers were first translated to English. Then all the whispers were coded and categorized into one or more categories. The contents of personal messages exchanged through the application were excluded from the analysis to maintain privacy of correspondence.

In addition, two online questionnaires were sent to the participants via e-mail. The first questionnaire was sent to each participant one week after they installed the application, and the second questionnaire was sent to everyone at the same time in the end of the field trial.

Participants

Altogether 162 individual users installed the application and registered as users. 21% of the participants were female and 79% were male, which is in line with the gender distribution of the technical university campuses. The average age of participants was 23 (min 18, max 48). 92% were students, rest were either staff members or some other affiliation. 78% of the participants were located at Tampere and 22% at Brno. 53 individuals answered the first-week questionnaire, and 24 answered the end-questionnaire.

Questionnaires

The questionnaires included both closed-ended and open-ended questions aiming to understand the respondent's usage of the application, experiences with it and respondent demographics. The first-week questionnaire aimed to discover the initial perceptions of the application and the activity with it, including questions such as: "What do you think Next2You is all about?" and "What did you do to collect Whispers?" The end-questionnaire aimed to reveal more detailed user experiences and behaviors, including questions such as "What kind of Whispers from others did you find interesting?" and "Did the achievements in Next2You motivate you to use it more actively?"

FINDINGS

We first give an overview of the N2U usage based on server-side logs and reported user experiences, followed by findings that are related to the design qualities of *progression* and *playfulness*.

Overview of Usage Activity

Interaction with the application and other users decreased with every step that required users to be more socially active. Figure 3 visualizes this conversion funnel of interaction during the trial.

From the users that installed the application and filled their details to take part in the trial, 93% (151/162) added at least one whisper. This means that they could take part in automatic exchanges upon encounters with other users. These participants created altogether 445 whispers. The average number of created whisper per user was 3, but 27% (44/162) created only one whisper.

72% of the participants (117/162) encountered at least one user, and exchanged whispers because of that. Altogether 477 exchanges were made during the trial. These exchanges took place between 349 individual pairs. In 79% of these pairs (276/349) only one whisper was ever exchanged. This means that many users did not experience the progressive disclosure of another user and only received the small amount of information provided in one whisper. 60% (97/162) of participants received at least one like for their whisper. Altogether 331 likes were given for 165 whispers.

38% of the participants (62/162) sent at least one private message. Altogether 474 messages were sent during the trial. This seems like a high number, but it is not the full truth. Our analysis did not cover the information content of private

messages, only the connections. Based on repeated messages between pair of users, we assume that 18% (29/162) took part in some sort of conversations with others. Our analysis on the message lengths tells that the messages were about 6 letters long. Just enough to say for example “Hello!” This lets us believe that messaging was not used extensively for the intended purpose of taking next steps towards face-to-face interaction but, rather, simply for testing purposes. Only 5% of the participants (8/162) registered a face-to-face meeting, and all of them only with one person.

It is likely that these numbers have been positively affected by actually familiar people interacting with one-another, rather than all interaction happening between actual strangers.

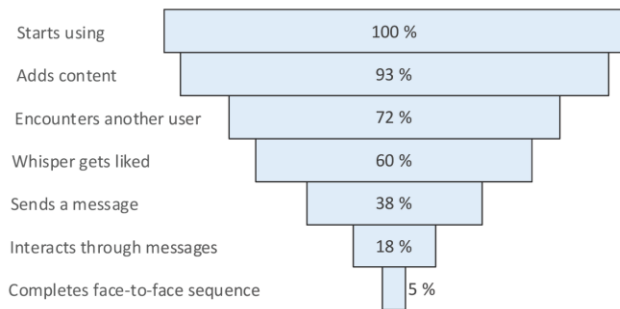


Figure 3. Funnel of interaction in the N2U trial.

Overview of reported user experiences

53 participants responded to the first-week questionnaire and 24 responded to the end-questionnaire. Intention to continue using N2U was high among those who answered the first week questionnaire, 70% (37/53) reporting to plan to continue using it. The mentioned main motivations were interest to meet new people (9/37), continuing to test the application while still unsure of its benefits (7/37), finding the application fun (6/37), belief in the concept (6/37), and being motivated by collecting (5/37).

“It’s nice to meet people which I see all the day and don’t know :)” (Male, 22 years old, Brno)

“I see a potential in this way of using modern technology to motivate users to be more social.” (M, 20, Brno)

The first-week questionnaire asked to describe in one’s own words what N2U is about. Meeting and connecting with new people was the most common impression but also other viewpoints were reported. The answers underline that people are likely to start using such applications with different expectations and motivations. For example, some focus on the content while others focus on the people, and some stress meeting while others stress anonymity. Table 1 presents our bottom-up, data-driven classification about the perceived essence of the application from the respondents’ descriptions. Overall, the participants seemed to have understood the gist of the application very well.

Table 1. Perceptions of what N2U is about

Meeting or connecting with new people	22
Starting conversations or messaging	7
Sharing and discovering ideas	5
Revealing common interests	4
Anonymity	3
Exploration	2
Awareness of what is nearby, curiosity	2
More personal social network	1
Encouraging face-to-face meetings	1

“I see it as more personal social network which by its principles encourages users to be more social by going to places with more people in order to collect their account information.” (M, 20, Brno)

“I think the main point is to have people to connect face to face, to make people talk to each other and remind them that a “whisper” is enough to have something to talk about. Actually it may help introverted societies (such as Finnish society) to learn how to communicate easily with each other.” (M, 28, Tampere)

N2U was experienced as playful, but was not successful in creating surprises. Figure 4. presents the distribution of answers to Likert-scale questions regarding the experiences of playfulness and surprises with N2U.

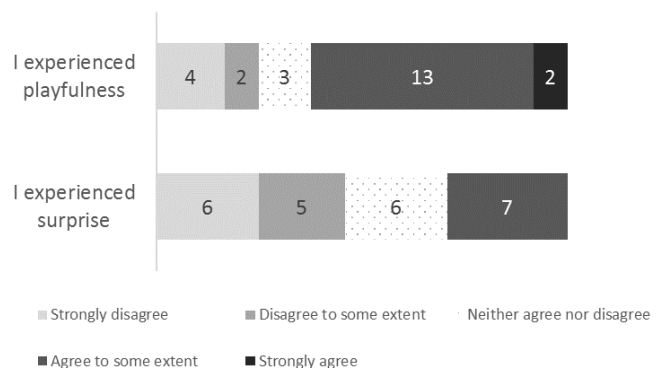


Figure 4. Experienced playfulness and surprise with N2U.

Even though our research artifact was technically well polished in general, there were some functionality issues that resulted in negative feedback. Some users faced sudden peaks in battery consumption, even though generally the battery consumption was such that it did not hinder normal use of the mobile device. Furthermore, the notification volume and notification timing received some complaints.

Design Principle: Progression

As said, with *progression* we refer to users progressing from awareness of others by acquiring more information about each other upon each encounter towards social interaction on different levels: automatic exchanges, lightweight technology mediated interaction of liking, messaging and face-to-face meetings. In the following, we report the

qualitative findings related to progression from the two questionnaires.

In general, the respondents perceived being able to view which users are nearby positively, despite the flip side of showing their own presence to others. 16/24 of end-questionnaire respondents expressed positive perceptions of it, describing their positive feelings and the social opportunities it provides. 3/24 expressed concerns, but did not really elaborate them.

"Exciting and thrilling." (M, 20, Brno)

"It gives potential for meeting new people, and organizing quick happenings" (M, 28, Tampere)

"A little scary" (F, 21, Tampere)

The respondents' perceptions of automatic exchange of content between nearby people were mainly positive (19/24). The explanations related to for example novelty and feeling of control. 4/24 expressed concerns that were related to privacy or security.

"Interesting, It's like twitter on roller skates." (M, 22, Brno)

"I really didn't think about it so I think it didn't bother me. I hoped to find more people to share things. I know I wouldn't share anything too private in my whispers so I wasn't worrying about sharing content..." (F, 30, Tampere)

"The automatic feature via bluetooth seems unsafe. I would prefer GPS for locating people/devices." (F, 27, Tampere)

As it can be expected based on the log data about number of exchanges between pairs of users, the experiences with progressive disclosure were mixed. Based on their experiences, 11/24 expressed positive perceptions of progressive disclosure of the profiles, while 4/24 expressed negative perceptions. Even some of those who had a positive perception of it commented that single whispers carry too little data, and that the application seems empty in the beginning. Whispers becoming out of context over time was mentioned as a downside as well.

"One whisper at the time make people more active." (M, 28, Tampere)

"...Seeing only one whisper from one user leaves it quite irrelevant and distant." (F, 39, Tampere)

The end-questionnaire respondents' experiences with the face-to-face feature were very limited. One respondent commented it being "all right". One had tried it with a friend but mentioned that they would not try it with others. Two had tried the feature but did not see the point. Others either did not try it or did not get it to work.

Design Principle: Playfulness

In this section we will go through how our main design choices related to playfulness (i.e., collecting, creation of playful content, and achievements) contributed to the user experiences of N2U.

Collecting digital game rewards from the physical world can be highly motivating as depicted by the research related to Pokémon GO [14, 19] and Nintendo StreetPass [18]. Collecting other people's profiles through automatic exchanges, however, did not seem to motivate our participants to explore the physical realm to such extent. The most common approach was passive exploring (42/53 of the first-week questionnaire respondents), i.e. carrying along the phone while running the application in the background. Participating in events and utilizing friends to provide exchanges were both mentioned by 8/53 respondents. Only 4/53 reported to have actively explored their surroundings to discover more users.

Even though the number of created whispers was more than what was exchanged eventually, their content may partly explain the lower-than-expected use of the application. The textual format itself was considered appropriate, but in addition to the intended playful content, there was a high share of nonsensical content, created by users who just wanted to test the application. This seems to have created demotivating experiences for others.

23/24 of the end-questionnaire respondents expressed positive perceptions of text-based content, some stressing how it feels better for considering privacy than other type of content. 7/24 mentioned hopes for being able to share also other content types, such as pictures.

We asked the end-questionnaire respondents to describe the content of the whispers they added, and about the ones they received. 10/24 described having created whispers just to be able to test the application. 8/24 had used whispers for self-presentation. 4/24 had whispered about timely events. 3/24 respondents specifically mentioned that they tried to whisper something that others could like.

"Mostly test whispers, about beer." (M, 23, Brno)

"My ideas and my feelings and some favourite quotes from lyrics of my favourite bands." (M, 22, Brno)

"Jokes. Something anyone could just "like"" (M, 28, Tampere)

When queried what kinds of whispers were or would be interesting, the responses were classified as follows: funny whispers (5/24), users' hobbies and interests (5/24), something personal like mood or feeling (4/24), information about nearby or upcoming events that the others are attending (3/24). A relatively high proportion, 10/24 respondents, claimed that they did not receive any interesting whispers, and some of them even thought that there would not be anything interesting to be received

"Funny whispers were the best ones." (M, 21, Tampere)

"...I would like to get whispers, that could show me if the other person is like me, if he/she thinks like me." (M, 19, Brno)

Our bottom-up classification of the content of the whispers revealed eight categories. Table 2 presents the categories and examples of whispers in them. One whisper may have been

categorized in several categories. Here for example “*Would you like to have a cup of C22H18O11 with me??*” would be categorized both in *Inviting contact* and *Playful*. The most common category was *general profile*, i.e., general information about oneself, such as home town or student status, as well as likes and hobbies. The whispers in the second most common category, *nonsense*, had no clear relevance and were most likely created just for the purpose of being able to try the app out. The third category was *playful* whispers. The fourth category was *timely information*, such as participating in an event, one’s current activity, current mood or experience. The fifth category included different kinds of greetings. The sixth category, *inviting contact*, included whispers with more active tone of voice, clearly trying to get someone to answer. As the two last categories, there was a small number of *vulgar* whispers as well as clearly *dating* oriented whispers.

Table 2. Whisper content categories.

Category	#	Examples
General profile	104	“I like ice cream.” “I am Peter” “I am optimist”
Nonsense	84	“1234567890” “hmmmm” “blablaba”
Playful	73	“I am beer powered problem solver” “Did you know that you can drink a lava, but only once?”
Timely information	73	“Is anyone here in the library?” “I am hungry”
Greetings	31	“have a nice meal !” “Hello everybody”
Inviting contact	30	“Anyone to chat?” “Would you like to have a cup of C22H18O11 with me??”
Vulgar	7	“Did you know that more times took pic of me peeing, than peed next to stranger guy”
Dating	5	“single girls call me” “offering love <3”

The application provided 11 predefined sentence starters and a possibility to write the whole sentence from scratch. The most commonly used option was to create the whisper from the scratch. These whispers include both the most interesting and the most irrelevant ones (researchers’ subjective opinion). See *Nonsense* category above in Table 2 for examples of irrelevant whispers, and examples of more interesting whispers below.

“Just got into 3D printing by buying Prusa i3 kit. I am so excited to assemble it.” (anonymized whisper)

“when you are in jeans you have to open doors by yourself but if you are in dress they are opened automatically” (anonymized whisper)

Half of the end-questionnaire respondents felt that achievements motivated to use N2U more actively. The scarcity of encounters seems to have decreased the power of achievements.

“I liked to take a look at them from time to time and I wanted to complete them but since there weren’t that many users I felt it wasn’t possible to do so.” (F, 30, Tampere)

DISCUSSION

Our trial findings show that our research artifact, N2U, was relatively well accepted and on the scale of the whole trial there was activity on each level: automatic exchanges, lightweight technology-mediated interaction of liking, messaging and face-to-face meetings. However, the interaction did not effectively progress towards face-to-face meetings on the scale of individual users. The progression in terms of new whispers from the same person remained low, and the conversion dropped on each level of interaction. The whole concept of conversion refers to the fact that not everyone proceeds towards the intended goal, so this was expected. In this case, the problems with conversion mean that the evaluation of the features and their effects on realized social interactions and user experiences proved to be challenging despite the breadth of the field study.

Another evaluation challenge is that there are no established criteria for success in encouraging social interaction between nearby strangers. What are the user behaviors and experiences that would reveal success? We argue that the numbers of resulted face-to-face meetings or new friendships are not the only relevant targets. In fact, our recruiting effort got 162 people to successfully install the application (until the point where they provided their e-mail address). From this number, 24 participants filled the end-questionnaire and 19 of them expressed positive perceptions of automatic exchange of content between nearby people. These numbers could be regarded in many ways. Rather, other possibly more relevant, benefits of the application include increased awareness of nearby strangers, experiences of curiosity, and joy caused by discovery of a playful piece of content. Such effects, however, are hard to be operationalized into scientifically valid measures.

In retrospect, we consider three main reasons to explain the problems with conversion: scarcity of encounters, quality of user created content, and engagement with the application. These can be further refined to issues with trial arrangements, technology and application design. The following discusses these perspectives in more detail and their relation to the design qualities of playfulness and progression.

First, we believe that the scarcity of encounters, that are the backbone of our application, failed to provide the instant gratification from collecting other users, which in turn led to users stopping to use the application, and this further prevented the intended progression. The scarcity of encounters also prevented the playfulness of the design to show its full power. The requirement for instant gratification is seen as a pattern of human behavior that should be considered in interface design [24]. Bluetooth, as the choice for detecting nearby users, has relatively short operation range, which requires a high density of users to result in

sufficiently frequent encounters. Our trial arrangements were apparently not good enough to counterbalance this choice of technology. Later in this section, we will discuss different design options for tackling these issues.

Second, the findings indicated a high number of nonsensical whispers as well as whispers conveying merely simple profile information. Another pattern of human behavior closely related to instant gratification, *deferred choices*, states that users do not want to spend time upfront answering questions but rather skip them and come back later [24]. Our design asked the users to add three whispers at start, which may have resulted in users adding nonsensical content just to get started with the application. The problem with poor quality content is related to both *progression* and *playfulness*: uninteresting content does not invite social interaction, and receiving such does not feel rewarding. We will later discuss different design options for ensuring good quality content.

Third, the trial findings furthermore show that while users adopted lightweight interaction of liking, they did not dive into conversations with others in large scale. While we did not query the reasons for this, we can speculate that much of this is likely explained by the scarcity of encounters. Furthermore, our design expected users to take a leap of faith from reading a whisper or liking it to sending a personal message to a stranger. We argue that the design of progression lacked a less serious level of content-mediated interaction, such as commenting whispers.

Our data gathering did not include client-side data logging, so our knowledge of the users' interactions with the application is limited. Based on the low number of exchanges and interactions between users, we can assume that there was scarcity of new whispers and messages that would have invited user to open the application. We will later discuss different design options for maintaining user engagement in the beginning of proximity-based applications between nearby strangers.

The trial findings show a proportion of participants that perceived playfulness and gamification positively. Naturally, the excitement was nothing compared to the global craze over searching Pokémon in the real world some months after our trial. Collecting whispers did not motivate the study participants to actively explore their physical surroundings. One explanation may be that it would have needed more positive reinforcement, receiving whispers at different times and places from different people, to first create a feeling that active exploration makes sense. This leaves us also pondering about the collectible nature of user profiles. Research on digital collecting suggests that making things challenging to acquire by demanding effort may enhance the value of collections [28]. On the other hand, research on collecting in digital games has found that, for example, the utility of the object and its rarity affect the perceived value [25]. The profiles of others in N2U proved indeed hard to acquire but the range of possible interactions with them were

limited and even though each profile is obviously unique, it is not possible to quantify their individual values. This collecting aspect is however, where N2U differs from most people-nearby-applications that allow online search of other users instead of requiring encountering them in the real world first.

Design considerations

To extend this retrospective deliberation, we have translated the identified issues into application and trial design considerations to help guide future work on this topic.

Supporting encounters

The scarcity of encounters between users was a clear problem affecting our trial in many ways. The longer detection range of WiFi Aware, which was not available during our trial, would be a better option for potential future implementations. GPS, even though not accurate indoors, would allow detecting nearby strangers with adjustable distances. Adjusting the definition of "nearby" could be a way to ensure exchanges during the early stages after the application launch, when a critical density of users is not yet formed.

Regarding the trial design, we did not want to create social interaction by rewarding it. We hypothesize that the following participant recruitment and rewarding strategy could solve the problem of maintaining user engagement while not compromising the results: The participants are recruited for two different purposes. One group is recruited to create enough density. They may receive a small reward for starting to use the system and having it running to ensure encounters and exchanges for the other group. The other group would be people who commit to providing feedback. They could be screened more carefully and in the end possibly rewarded for giving feedback. Screening could target specific user characteristics like introverts.

Application design related considerations for ensuring encounters include the following. Our design demanded reciprocity for exchanges to happen, i.e. if another user had created five whispers and another had created only three whispers, their encounters would not leave any mark after the three encounters. Related to *playfulness*, for the application to reward in the cases where the profiles include different numbers of whispers, the reward mechanism could be separated from receiving user-generated content. Again, to ensure exchanges and make the experience more rewarding in the early stages, each encounter could start a series of few exchanges during the following days, which would be refreshed by another encounter or seize if no encounters happen. Each exchange would serve as an invitation to technology-mediated interaction, i.e., support *progression*. Our Bluetooth based approach did not give a possibility get any information about where to search other users. GPS based application could be used to give at least some clues to user where and when one might encounter others. This might encourage the playful action of active exploration and also prevent disappointments of fruitless

explorations. However, as anonymity and privacy concerns are central to these kinds of applications, pointing the exact location of other users is not what we mean with this.

Supporting creation high-quality content

Receiving uninteresting content, either nonsensical content or uninteresting basic information, was not experienced as rewarding or playful. We expected the users to have challenges in coming up with relevant and suitable content for such new application type, as suggested by our early stage research on the same concept [16], but we believed that the lightweight interaction of liking and seeing examples from others would encourage the users to modify their whispers. It seems that better and faster means to ensure good quality content are required. As possible means to this, we see the following. First, before creating their own profile, users could already get a glimpse of what others share, for example most liked whispers this week. Second, content could be imported from user's other social media profiles or automatically generated from activities, for example, in social media and games. Third, the basic profile information could be separated from the dynamically shared content, and shared already in the first encounter. Finally, to support the evolution of collective norms of shared content and to get rid of uninteresting content, disliking could be introduced to motivate users to rethink the quality of their whispers.

Supporting engagement with the application

Supporting engagement starts by supporting encounters and quality of content. We see the following as additional means to support engagement with the application. N2U users were able to access the whispers only through profiles. Therefore, a *content feed*, which would give an easier access to the whispers from the encountered users, could have been useful for inviting more technology-mediated interaction, i.e., second level of *progression*. To support the engagement with the application in a *playful* way, the application could feature some standalone activities like generating playful content within the application or interacting with the content in a playful way. The playful collecting aspect could be strengthened by introducing a clear collectable element, whose value can be quantified, to each profile. Following the example of StreetPass, the application could have mini-games that are powered with the encounters or even played without them to give a reason for the user to visit the application. Another, and probably the most viable option, is to build interaction with nearby strangers as a feature to already successful applications.

CONCLUSION

We explored the design qualities of playfulness and progression by arranging a field trial with our research artifact, Next2You, a proximity-based mobile application aiming create social experiences and encourage social interaction between nearby strangers. While playfulness as a quality has been relatively well studied, the concept of social progression, i.e., first creating mediated interaction between nearby strangers and then converting the mediated interaction into face-to-face interaction, remains largely

unexplored. The application design presents several features manifesting these design qualities.

The application managed to encourage various interactions that we argue would not have otherwise taken place. While the qualitative results could be considered to support the relevance of these two design qualities, in such an in-the-wild trial, it is challenging to measure the specific effects of the designed features. This was challenged by insufficient critical density and other practical limitations (thus scarcity of interaction) in the trial, and partly also by weaknesses in the design. This kind of hyperlocal communication between strangers represents a new, unparalleled communication medium. This means that the participants did not have the time to establish norms and good practices about what to share. At the same time, receiving nonsensical content further decreased the users' motivation.

We argue that Next2You was based on well-grounded reasoning inspired by prior design and research with similar intentions. Similarly, the field trial, compared to the norms in HCI, was relatively extensive and long-term. Yet, the results about the social effects of Next2You disappointed the authors. The low conversion made it difficult to draw strong conclusions. We see places for improvement in both the application and trial design. As a result of this, we provide an extensive list of design considerations for applications that have such ambitious aims of creating positive behavioral effects on social interaction amongst strangers, and trials aiming to evaluate it.

All in all, this study implies that we need both more design contributions to address social encouragement and more applicable methodologies to study the social effects of technology in a valid fashion. Particularly the concept of social progression still calls for new approaches and courageous design explorations.

ACKNOWLEDGMENTS

This research was funded by Academy of Finland (grants 283110 and 295895).

REFERENCES

1. Bassoli, A., Moore, J., & Agamanolis, S. 2006. tunA: Socialising music sharing on the move. *Consuming music together*, 151-172.
2. Jay Chen and Azza Abouzied. 2016. One LED is Enough: Catalyzing Face-to-face Interactions at Conferences with a Gentle Nudge. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing (CSCW '16)*. ACM, New York, NY, USA, 172-183. DOI: <https://doi.org/10.1145/2818048.2819969>
3. Nathan Eagle and Alex Pentland. 2005. Social Serendipity: Mobilizing Social Software. *IEEE Pervasive Computing* 4, 2: 28–34. <https://doi.org/10.1109/MPRV>

4. Nicole B. Ellison, Jeffrey T. Hancock, and Catalina L. Toma. 2012. Profile as promise: A framework for conceptualizing veracity in online dating self-presentations. *New Media & Society* 14, 1: 45–62. <https://doi.org/10.1177/1461444811410395>
5. Mattias Esbjörnsson, Oskar Juhlin, and Mattias Östergren. 2004. Traffic encounters and Hocman: Associating motorcycle ethnography with design. *Personal and Ubiquitous Computing* 8, 2: 92–99. <https://doi.org/10.1007/s00779-004-0260-4>
6. Lars Erik Holmquist, Jennica Falk, and Joakim Wigström. 1999. Supporting group collaboration with interpersonal awareness devices. *Personal Technologies* 3, 1–2: 13–21. <https://doi.org/10.1007/BF01305316>
7. Joey Chiao-Yin Hsiao and Tawanna R. Dillahunt. 2017. People-Nearby Applications. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing - CSCW '17*, 26–40. <https://doi.org/10.1145/2998181.2998280>
8. Mizuko Ito, Daizuke Okabe, and Ken Anderson. 2009. Portable objects in three global cities: The personalization of urban places. *The reconstruction of space and time: mobile communication practices*, 67–87.
9. Yukari Iwatani, Y. 1998 "Love: Japanese Style, Wired News". www.wired.com/culture/lifestyle/news/1998/06/12899
10. Pradthana Jarusriboonchai, Thomas Olsson, Vikas Prabhu, and Kaisa Väänänen-Vainio-Mattila. 2015. CueSense. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems - CHI EA '15*, 2127–2132. <https://doi.org/10.1145/2702613.2732833>
11. Younghee Jung and Jan Blom. 2006. Scent Field Trial - Understanding Emerging Social Interaction. 69–76.
12. Vassilis Kostakos, Eamonn O'Neill, and Anuroop Shahi. 2006. Building Common Ground for Face Interactions by Sharing Mobile Device Context. *Proc. Location and Context-Awareness (LoCA)*, 222-238
13. Leah E. LeFebvre. 2017. Swiping me off my feet. *Journal of Social and Personal Relationships*: 26540751770641. <https://doi.org/10.1177/0265407517706419>
14. Susanna Paasovaara, Pradthana Jarusriboonchai, and Thomas Olsson. 2017. Understanding collocated social interaction between Pokémon GO players. In *Proceedings of the 16th International Conference on Mobile and Ubiquitous Multimedia (MUM '17)*. ACM, New York, NY, USA, 151-163. DOI: <https://doi.org/10.1145/3152832.3152854>
15. Susanna Paasovaara, Andrés Lucero, and Thomas Olsson. 2016. Outlining the design space of playful interactions between nearby strangers. In *Proceedings of the 20th International Academic Mindtrek Conference (AcademicMindtrek '16)*. ACM, New York, NY, USA, 216-225. DOI: <https://doi.org/10.1145/2994310.2994344>
16. Susanna Paasovaara, Ekaterina Olshannikova, Pradthana Jarusriboonchai, Aris Malapaschas, and Thomas Olsson. 2016. Next2You: a proximity-based social application aiming to encourage interaction between nearby people. In *Proceedings of the 15th International Conference on Mobile and Ubiquitous Multimedia (MUM '16)*. ACM, New York, NY, USA, 81-90. DOI: <https://doi.org/10.1145/3012709.3012742>
17. Susanna Paasovaara, Ekaterina Olshannikova, and Thomas Olsson. 2015. Collaborative Video Challenges. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems - CHI EA '15*, 1923–1928. <https://doi.org/10.1145/2702613.2732882>
18. Susanna Paasovaara and Thomas Olsson. 2016. Proximity-Based Automatic Exchange of Data in Mobile Gaming. In *Proceedings of the 9th Nordic Conference on Human-Computer Interaction - NordiCHI '16*, 1–10. <https://doi.org/10.1145/2971485.2971508>
19. Janne Paavilainen, Hannu Korhonen, Kati Alha, Jaakko Stenros, Elina Koskinen, and Frans Mayra. 2017. The Pokémon GO Experience: A Location-Based Augmented Reality Mobile Game Goes Mainstream. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17)*. ACM, New York, NY, USA, 2493-2498. DOI: <https://doi.org/10.1145/3025453.3025871>
20. Eric Paulos and Elizabeth Goodman. 2004. The familiar stranger. In *Proceedings of the 2004 conference on Human factors in computing systems - CHI '04*, 223–230. <https://doi.org/10.1145/985692.985721>
21. Per Persson, Jan Blom, and Younghee Jung. 2005. DigiDress : A Field Trial of an Expressive Social Proximity Application. 195–212.
22. Robert D. Putnam. 2000. *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon & Schuster.
23. Jan Seeburger, Marcus Foth, and Dian Tjondronegoro. 2012. The sound of music: sharing song selections between collocated strangers in public urban places. In *Proceedings of the 11th International Conference on Mobile and Ubiquitous Multimedia (MUM '12)*. ACM, New York, NY, USA, , Article 34 , 10 pages. DOI=<http://dx.doi.org/10.1145/2406367.2406409>.
24. Jenifer Tidwell. 2010. *Designing interfaces: Patterns for effective interaction design*. O'Reilly Media, Inc.

25. Zachary O. Toups, Nicole K. Crenshaw, Rina R. Wehbe, Gustavo F. Tondello, and Lennart E. Nacke. 2016. "The Collecting Itself Feels Good": Towards Collection Interfaces for Digital Game Objects. In Proceedings of the 2016 Annual Symposium on Computer-Human Interaction in Play (CHI PLAY '16). ACM, New York, NY, USA, 276-290. DOI: <https://doi.org/10.1145/2967934.2968088>
26. Sherry Turkle. 2012. Alone together: Why we expect more from technology and less from each other. Basic books.
27. Kaisa Väänänen-Vainio-Mattila, Petri Saarinen, Minna Wäljas, Marko Hännikäinen, Heikki Orsila, and Niko Kiukkonen. 2010. User experience of social ad hoc networking: findings from a large-scale field trial of TWIN. In Proceedings of the 9th International Conference on Mobile and Ubiquitous Multimedia (MUM '10). ACM, New York, NY, USA, , Article 10 , 10 pages. DOI=<http://dx.doi.org/10.1145/1899475.1899485>
28. Rebecca D. Watkins, Abigail Sellen, and Siân E. Lindley. 2015. Digital Collections and Digital Collecting Practices. In Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15). ACM, New York, NY, USA, 3423-3432. DOI: <https://doi.org/10.1145/2702123.2702380>
29. John Zimmerman, Jodi Forlizzi, and Shelley Evenson. 2007. Research through design as a method for interaction design research in HCI. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '07). ACM, New York, NY, USA, 493-502. DOI: <https://doi.org/10.1145/1240624.1240704>
30. Happn. Retrieved April 15, 2018. <https://www.happn.com/>
31. N2U. Retrieved April 15, 2018. <https://play.google.com/store/apps/details?id=fi.tut.cs.social.proximeety> (Europe only)
32. Pokémon GO. Retrieved April 15, 2018. www.pokemongo.com
33. StreetPass. Retrieved April 15, 2018. <https://www.nintendo.com/3ds/built-in-software/streetpass>
34. Tinder. Retrieved April 15, 2018. <https://tinder.com/>