

Designing The Technology For Pet Owners' Psychological Safety And Pet Physical Safety: identifying the challenges, needs and conceptualizing solutions for pet location tracking

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The scale of pet ownership significantly increased in last years, with 92.9 million dogs and 113.6 million cats estimated to be pets in Europe. The following research focuses on how pet location tracking technology design can support pet owners' mental safety and pets' physical safety during times of separation. Through participatory design consisting of mind maps, brainstorming and user stories, the target audience identified their primary concerns and developed solutions that an ideal location-tracking mobile app could provide including the mapping of the surroundings, social networks, safe zones or heat maps. The attendees' insight showed that they anticipate a significantly more broad set of functionalities than just location itself. In the user stories participants expressed their perception of their mental safety in different scenarios of physical separation in case their pet was lost, they left the pet in one's care or if they had to leave their pet in order to go to work. 29 out of 30 inputs concerning the feelings after using the 'ideal' app were in the positive spectrum of calmness, happiness and feeling in control. We found that a well design location tracking app can reduce the anxiety and concerns of pet owners.

Additional Key Words and Phrases: Location Tracking, Safety, Smart Technology, Ubiquitous Technology, Pet's Physical Safety, Emotional Safety, Smartphone Application, Design Workshop

1 INTRODUCTION

We researched pet location monitoring technology and its function in supporting pet owners' psychological safety and pets' physical safety during times when they are apart in order to offer a comprehensive solution. We looked at how pet tracking software design might help pet owners feel in control and at ease by answering their worries and demands during the periods of separation anxiety. To enable efficient monitoring and guarantee a positive user experience, we underlined the significance of user-friendly interfaces, timely notifications, and customizable options. In addition, the incorporation of tools like geofencing and real-time communication reduced risk factors while managing separation anxiety. This work's contributions offer insightful information on the planning and execution of pet location tracking systems and their potential effect on pet owners' (specifically of dogs and cats) mental safety.

2 RELATED WORK

The increasing number of pet owners [4] and the rise of separation anxiety between pets and their owners during periods of separation [6, 12] present significant challenges in ensuring the psychological and physical safety of both parties. A large survey of U.S. pet owners explored the concerns and stressors associated with caring for pets during the pandemic,

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offering insights into the specific challenges faced by pet owners [8]. Delgado investigated the influence of dogs on women's perceptions of safety in emotional contexts, emphasizing the potential positive impact of dogs on psychological well-being [12]. Relevant insight may also be found in studies examining the links between human attachment, pet attachment, depression, anxiety [14], and general mental health [11]. Despite numerous studies in the veterinary field consistently highlighting the presence of separation anxiety in dogs [13] and cats [15] rather small amount of research has delved into people's separation anxiety in relation to their pets. More insight is provided by the studies that explored the relationship between people's separation anxiety towards pets and towards other humans [9, 10]. These researches showed that the attachment towards dogs is significant, just a little bit lower and sometimes even equal to the attachment to family figures [10]. Moreover, pet owners' attachment to a pet may rely on social support and external human factors [9]. Pet owners typically worry about their pets' welfare during periods of physical separation, leading to the need for inventive solutions to ease their fears. To answer those needs various solutions are designed and researched. A vast part of those solutions come in the form of wearables, mostly devices attached to collars [1-3, 5]. In more academic-centred than commercial solutions we may observe the usage of ultra-wideband (UWB) radios and an accelerometer enclosed to a pet's collar; Moreover, mobile apps seem an inherent compound [5]. Accelerometers are often found technology in location solutions alongside AI algorithms tracking and recognising pets' poses [7].

When it comes to existing commercial solutions, "Tractive GPS Pet Tracker" [3] stands out as the most well-liked (with more than a million of downloads in Google Play) and feature-rich mobile and web application. It focuses on real-time tracking, geo-positioning and full health monitoring. Our participants' insight matches with features like real-time tracking and geo-fencing. "Pawfit Pet GPS and Activity Monitor" [2], which was downloaded more than 10000 times from Google Play, features geo-fencing, real-time tracking, and enhanced activity monitoring with temperature alerts. What makes this app unique among the others is its focus on pet temperature. This feature was not listed by our participants among the most essential features for tracking a pet. On the other hand, "iPet GPS Tracker" [1] with more than 10000 downloads from Google Play, boasts all the aforementioned, and two-way communication features, which ensures better contact between pet and pet owners and a consistently high level of user engagement. As in some cases with our study participants, it was noted that in addition to location, it would be great to have voice output to tell the pet a command, such as: "Stay!" (P7). The demand for pet tracking apps is high and as the pet owners group is growing dynamically it is not going anywhere in the near future.

3 METHODS AND PROCEDURE

3.1 Methods used in the study

Individuals were recruited from the existing social network of the researchers. The only requirement for participants was to be current or past dog or cat owners. Firstly, the participants were provided with questionnaires and asked to provide a few details about their pets. The survey delivered quantitative data like demographics and to a smaller degree some qualitative data about pet ownership and experience with pet location tracking apps. We found this medium useful in gathering less profound yet required data while taking little time for participants to fill in. Surveys were held on the platform surveymonkey.com and took on average 2 minutes (see Appendix A). The details about their pets were used during the co-design session in order to bond the attendees and make them more invested in the study.

The study consisted of two parts. The co-design session was a participatory design consisting of mind maps, brainstorm and user stories. User-centred research lies at the core of understanding and exploring already existing as well as newly created needs that follow the dynamically changing expectations as well as conditions of dog and cat

owners. It aimed to provide a proactive and open approach to participants for them to deliver relevant insights. The brainstorming was audio recorded as well as the discussion between the participants. The mind maps and stories were written by hand. From the co-design session, two sources of input were analysed: the brainstorming ideas (as well as the process) and user stories (see Appendix B) The transcribed data was used for thematic analysis. The co-design session lasted on average 1.5 hours in groups of 2-3 people. Four studies were conducted resulting in a total of 11 participants.

3.2 Co-Design Session Procedure

Greetings, Written Consents (3 min), Ice-breaker (7-10 min): attendees introduced themselves and their pets.

Mind Maps (6 min): Aimed to reflect on the following questions 'You without your pet' and 'Location tracking apps'.

Brainstorming (30-40 min): Two questions were presented on the whiteboard: 'What features does the perfect pet tracking app provide?' and 'What does it look like?' Participants were encouraged to generate as many ideas as possible. Collaboration was optional. In the end, all ideas were discussed in a group.

Stories (30 min): Participants were given a dummy dog plushie and tasked to name it and describe its personality as a team in order to create their 'team' pet. To set the context, the researcher took the personalized dummy and placed it out of sight. Participants were instructed to fill in the provided stories, considering their feelings about their absent pet. Three stories considered different scenarios: one's pet got lost, one left their pet in a trusted care and one had to come back to onsite work in the office after a long home-office setting, leaving their pet behind (see Appendix B, Figures 2, 3, 4).

4 RESULTS

Brainstorm provided insightful input concerning needs, challenges and design aims for the pet-locating app. The stories concentrated not only on the users' expectations of the app but also on their emotions and their perception of mental safety in specific scenarios.

Most stories' inputs exhibit emotions of a very positive spectrum in different scenarios of using the app. Each story provided insights into participants' state of mind after using the location tracking app in a specific scenario - 29 out of 30 entries were positive; specifically, the emotion of 'being calm' appeared 15 times ('calm', 'at ease', 'less anxious', 'at peace'), and 13 times various feelings of happiness were mentioned ('happy', 'pleased', 'excited', 'thankful', 'ready to enjoy my trip').

Concerning the brainstorming findings, a notable thread can be observed. Potential users expect more from pet location tracking apps than just basic location information. They desire a greater sense of control, often fueling their curiosity about their pets' whereabouts. They would like to keep track of their pets' favourite places, such as trails they use most often or where they like to spend their time mostly in a home, for instance: 'The place where he sleeps'(P2) or 'GPS and the analytics where the dog likes to go' (P3). Two suggestions concerned providing a heat map: 'Maybe provide a heat map to show) where your pets usually stay'(P1). Four participants in three different co-design groups proposed to have a map not only of the area where they live but also a detailed plan of their home and surroundings. One of the participants suggested 3D live modelling of the surroundings that would be accessible in the app and 2 others the video output that could provide a visualization of where the pet is at a certain moment. Another idea was to show the location of the other users of the app using their location for example in the pet owner's neighborhood or area. Data privacy emerges as one of the insights provided by participants. For instance, an issue connected with location and sharing its access: 'You have a sketchy neighbour. But like you didn't know he was sketchy (...) You left the dog with him for a week and gave him access to the app and maybe he never disconnected. He would track when you

are going on the walks' (P11). Including concerns about accidental invasion of privacy: 'My friend and I are sharing my dog, then I don't really necessarily have to have access to his house.'(P3). Worth mentioning is also the indissolubility of pets' data and owners' data: 'It should protect all the information it collects. It obviously is tracking my pet, which could sometimes be me as well.' (P2)

5 DISCUSSION

The thematic analysis of the user stories as well as the brainstorming process and discussion showed that location tracking generally has a positive effect on mental safety by providing the owners with a tool that makes them feel more in control and at ease as well as allows them to get to know their pet a little bit more. Interestingly, it emerged to be crucial design-wise to maintain a delicate balance between control and freedom. Excessive checking for notifications and possible false negatives could trigger anxiety in some users and therefore can actually diminish their sense of mental safety. On that account, the application design must ensure the highest probability of avoiding the false negative (for example receiving a notification that something dangerous had happened while maybe it was simply read incorrectly by the app). Moreover, it must provide an extensive personalization option for owners to set and decide for themselves what they consider 'dangerous' and 'safe'.

These expectations indicate a growing need for comprehensive pet management tools that go beyond mere location tracking in a simple form of a map. Such features may come beneficial while on walks with a dog or a cat in most cases; in case of the pet being friendly and willing to socialize, the app could provide the whereabouts of other pet owners and their pets in the area where one could meet them. In the opposite case of a reactive, non-social pet or for instance a pet during estrum, the app may aid in omitting other animals on walks or ventures.

As a target group cat and dog owners proved themselves to be truly passionate, creative and very concise with their needs. Often bonding with other pet owners during the participatory design and taking up each activity very seriously and with an open mind, providing very utilitarian and insightful input.

For the future the following limitations should be considered: English as not the mother tongue of the participants, enlarging the target group, mobile app design restraints as well as strong emotional engagement of pet owners. Future research in the field of pet tracking can focus on leveraging the potential of the Internet of Things, monitoring the vital functions of pets or wearables with audio and video input/output. Eventually, exploring the concept of animal-computer interaction can highly contribute to the notion of owners' and pets' mental and physical safety.

6 CONCLUSION

Pet location tracking technology design can support pet owners' psychological safety and pets' physical safety during periods of separation and affect both the aforementioned positively by reducing feelings of anxiety or lack of control. This research offers a unique contribution by examining the emotional experiences of pet owners during periods of separation and leveraging these insights to derive design implications for an application that aims at assisting them in coping with associated challenges. Employing proactive and user-centred methodologies, the study focuses on enhancing features of an existing solution, aiming to identify potential areas for improvement rather than hypothetical creations.

The notion of human-computer interaction and its effect on psychological as well as physical safety is relevant for a substantially wide group of users. However, this specific research brings a noteworthy insight into the pet owners' target (specifically cat and dog owners) which is a significant, diverse (age, profession, gender, ability-wise) and dynamically growing target group.

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A SURVEY QUESTIONS AND RESPONSES

link to the results of a pre-workshop survey: https://de.surveymonkey.com/results/SM-ztdt2KAvcKRAoUgzFigmQ_3D_3D/

B WORKSHOP MATERIALS

B.1 Pets' Card

B.2 Mind maps Topics

The participants were given two sheets of paper with the phrases below in turn. Each topic on a separate sheet of paper. People had to construct a mental map with any words and phrases that came to mind.

- (1) "Me without my pet"

Age: _____	
Location: _____	
Favorite things: _____	

Least favorite things: _____	
_____	_____

Fig. 1. A pet profile card that we asked participants to fill out about their animals before the workshop

- (2) "Location tracking apps"

B.3 Workshop Questions

Based on the mental maps created, participants had to come up with as many ideas as possible that answered these 2 questions:

- (1) What features does the perfect pet tracking app provide?
- (2) What does it look like?

B.4 Stories Prompts

Participants hand-filled these stories individually in any order they wanted (Fig. 2-4).

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You are on vacation in Italy. You have left your pet in the care of a trusted friend or trusted pet sitter. However, you feel pretty comfortable since you know that your pet is

_____. Your location tracking app has a number of handy features for staying in touch with _____ (name). You've been enjoying pizza and the beach every day but today you feel anxious about not having your pet near you. You trust your friend/pet-sitter but you haven't heard from them in a while. You decide to check up on your pet by using _____ in the location tracking app. After doing the above in the app you feel _____ and your mind is _____.

Fig. 2. Story template 1

Your pet _____ (name) is a lively and curious company. It is quite independent and it already happened a few times it got lost and wandered off even for a longer periods of time. Recently you've downloaded a pet location tracking app with real-time updates because you thought that it _____. Unfortunately one Tuesday evening you notice _____ (name) is missing again, you've looked everywhere and you have no idea where it may be. You decide to use the pet location app and you use _____ features. You see him/her in the app! You feel _____. He/she has wondered off to the neighbors garden two streets from you. You go there to find _____ (name) in the garden safe and feel _____.

Fig. 3. Story template 2

Spending a lot of time with your pet made you feel

but on the other hand

Recently your employer introduced a hybrid mode of work with 3 obligatory days a week in the office. Since _____(name) is used to your presence for the last 3 years and the separation might be difficult to introduce, you decide to use pet location tracking app while you are at work in order to

It is your first day back in the office you feel

_____ about your pet staying back home. You remind yourself that you have the pet tracking app so you use it, especially these features:

Fig. 4. Story template 3