Icebreaker: A mobile platform for location-based networking
(Technical Report)

How Responsiveness and Anticipation can Guide the Ethical Design of Location-based Services
(STS Topic)

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Introduction

According to a survey conducted by Lou Adler (2016) involving over 3000 people in staff and management roles, nearly eighty-five percent of jobs are filled through networking. Although many job offerings can be found online, universities still hold career fairs and other networking events to give their students a better chance at finding the right fit for a job by meeting potential recruiters in person. Many students and recruiters still rely on physical pamphlets and business cards in order to share contact and company information at these events, despite the fact that over 88% of business cards get thrown out within a week (Frost, 2017). Additionally, students and recruiters at these events can often be indistinguishable, which can lead to futile conversations and lost time. At sales meetings, technology conferences, and company gatherings, event attendees may be seated at the same table with potential employers or collaborators, but not recognize it.

Direct, face-to-face interactions are an essential part of networking, but mobile networking platforms tend to only focus on the remote follow-up and not on the initial interaction. Networking platforms such as LinkedIn or Quora may be used to remotely follow up on interactions with potential employers and other colleagues, but offer no way to help employees and employers make the initial connections with the right people and seamlessly share information with new contacts at in-person events. The solution to finally enhancing direct, face-to-face networking is by using location-based technology to help networking event attendees share and exchange information with nearby users in real-time.

Icebreaker © is a mobile, location-based networking platform that enhances the way employees and employers network in-person by providing a mobile tool for identifying other potential connections in the room and instantly sharing contact information with nearby users.

This platform allows users to display a digital business card that is visible to nearby colleagues in a specified vicinity (the 'pond') so that they can see who they would want to connect with and share electronic business cards digitally so they never get lost. Precise geofencing, or location-tracking technology, will allow users to filter and locate users in the same room based on available information on their public cards such as their university, occupation, or individual enterprise. Young professionals, recent college graduates, and company recruiters can gain a networking advantage by using this localized information to identify and share information with nearby contacts at events like career fairs, conferences, sales meetings, technology talks, for example.

The technical topic of this prospectus will focus on how Icebreaker's location-tracking functionality will address the mentioned challenges with in-person networking and improve on existing solutions. This will include examining the current landscape for professional networking applications as well as exploring technical obstacles associated with the design of Icebreaker. I will extend this research analysis by anticipating the social concerns of relevant stakeholders and exploring how Icebreaker can address the ethical challenges associated with location-based platforms through the framework of responsible innovation.

Technical Topic

The goal of this technical project is to design a mobile application that improves the networking capability of users at in-person networking events by providing a robust system for identifying useful connections nearby and exchanging contact information. The key differentiator of this system will be its geofencing capabilities, so that users can view only the

digital business cards of users within the same general room or building. However, in a research study on the evolution of location-based services, Huang et al. (2018) suggested that location-accuracy for mobile platforms like Waze and Parkbob is often compromised in dense urban environments. This presents a major potential technical challenge as Icebreaker would primarily be used at crowded networking events such as career fairs, which could be considered a dense environment of digital users.

However, according to *Nic Newman's Apple iBeacon technology briefing* (2014), mobile iOS devices with iOS versions 7 and later could enable accurate location-sensing in close proximities through the integration of the "Core Location" application programing interface (API). Apple's Core Location API provides programmable software that synchronizes with Apple iBeacons, which are small embedded Bluetooth radios in iOS devices that can emit short-range signals (Newman, 2014). While this does introduce one technical constraint on the versions of devices that Icebreaker can be made available to, further research into this technology might provide a reliable way to ensure that users can see accurate information on the main interface when viewing nearby business cards.

Further analysis into the existing technology for facilitating professional networking will help provide insight into what solutions have been attempted before and how Icebreaker can provide a more creative and impactful approach. Shapr is a mobile platform with over half a million users as of 2019 and uses a swipe-based approach to remotely connect with business professionals (Coheen-Breen, 2019). It allows users to display information from their LinkedIn page to others within a several-mile radius and swipe right to begin connecting with a person that matched. However, Shapr primarily focuses on facilitating networking through online connectivity and communication with professionals in the same city or region, whereas

Icebreaker is targeted towards real-time interaction and will facilitate networking between users in the same room or building.

CamCard is another popular networking app that aims to replace the paper business card by providing a platform for users to exchange digitized business cards and scan paper business cards into a digital format (Tedeschi, 2010). However, CamCard has limited value when used at in-person events that can be addressed with the design of Icebreaker. CamCard's digital business cards can only be shared via email, phone, or with a QR code, effectively requiring a user to already have some contact information about a person before they can exchange business cards. By providing a real-time, location-based forum, users of Icebreaker will be able to view nearby business cards instantly, have more information to facilitate an introduction, and share and save these cards directly within the app.

By researching advancements in existing location technology and identifying limitations of similar mobile platforms that can be improved upon, this approach will lend useful insight into how the design of Icebreaker will enable new applications of location-based technology. Users can filter cards in the local "pond", or feed of nearby business cards, to locate fellow alumni at a conference, start a conversation with an employee at happy hour or an employer at a career fair, or digitally save the cards of customers at a meeting so they never forget someone's name again. Students will be able to identify where recruiters and other students at a career fair work and know immediately who is in the room with them. Guest speakers, musicians, or club leaders can share their professional or social information to the audience instantly by advertising their business card to the local pond.

How can Anticipation Help Create Socially-Robust Platforms that Use Location-Data?

The integration of location-based software into a social networking platform opens a diverse array of applications for Icebreaker that will consequently involve the interests and concerns of stakeholders beyond the targeted users: job-seekers and recruiters. Organizers of networking events such as university career services often serve as the medium between the job recruiters, young professionals, and special guests that attend these networking events, and may have concerns such as protecting the privacy of their attendees. This section will start to anticipate the ethical challenges associated with location-based platforms and the unforeseen consequences on both these direct users and indirect stakeholders. This analysis will be primarily conducted through the framework of *responsible innovation*, as addressing the social and technical dimensions of location-based technology will be integral in the development of Icebreaker.

Responsible innovation is a theory that describes that the technical design process involves both innovators and societal actors who are mutually responsive to each other with regards to the "acceptability, sustainability, and societal desirability" of the product being developed (Schomberg, 2012, p. 47). In *Developing a framework for responsible innovation,* Stilgoe et al. (2013) defines anticipation as a major societal aspect of responsible innovation that calls on scientists and innovators to practice foresight of detrimental implications involving both primary and secondary stakeholders of their products. Anticipation forces technology developers to consider different contingencies early in design process in order to increase resilience and guide "socially-robust risk research" (Stilgoe et al., 2013, p.1570). Developers can practice anticipating risks with systematic techniques like horizon scanning. Horizon scanning is a technique for informing decision makers about future threats for a product by methodically

considering what technologies and social trends can be considered constant now and what might change in the future. When developing location-based platforms, anticipating potential implications with this form of scenario-planning can help guide the design process so that sensitive location-data cannot be used maliciously and all stakeholders are comfortable using the platform.

A common implication that arises from location-based technology is concerns with data privacy. One research study examined the impact of location-based social networking on trust between college students by gathering quantitative data through five focus groups of around 15 students enrolled in professional ethics courses (Fusco et al., 2011). Each focus group was asked a series of qualitative questions on the social implications of location-based technology and how it affected relationships with groups of people including family, friends, co-workers, government entities, and commercial entities. The results of this study highlighted privacy as one of the most frequent concerns of college students using these mobile platforms, particularly among those who did not fully understand what data they were sharing to their location-based network.

Secondary stakeholders of the Icebreaker platform are likely to share these privacy concerns about location-based data gathering. The institutions that organize the networking events for users of location-based platforms must hold accountability for protecting the information of attendees in order to maintain a trustful relationship with them for future events. In a detailed review of location-based technology, Abbas, Michael, and Michael argue that the two prominent ethical dilemmas associated with location-based platforms are "the risk of privacy breaches" and "the possibility of increased monitoring leading to unwarranted surveillance by institutions and individuals" (2014, p.11). For event organizers such as career services, privacy breaches of recruiter contact information from visiting companies can harm employer relations

and decrease the effectiveness of a location-based platform if less employers trust the application. Additional stakeholders such as investors and sponsors of networking events where location-technology is used might experience financial consequences resulting from less users on the app and a damaged reputation. Unwarranted surveillance over location-data could entail additional stakeholders such as policy-makers and government research agencies who may take regulatory actions to protect the privacy of users. For example, the European Union implemented the General Data Protection Regulation (GDPR) in 2018 in order to enforce strict standards on the tracking and collecting of identifiable data, including location-data (Huang et al., 2018).

By anticipating the privacy concerns of all stakeholders for a location-based platform, scientists and innovators can account for potential societal resistance with predictive measures taken early in the design process. In addition to predictive modeling of potential outcomes, anticipation in the framework of responsible innovation requires acknowledging areas of uncertainty about the risks and benefits of a product. Developers of location-based technology have begun employing privacy-enhancing techniques such as anonymization with spatial generalization, where the relative distances between app users can be tracked but the exact location details of users are hidden (Duckham et al., 2007). Privacy can be incorporated into design by allowing users of location-based services to choose between different privacy modes, which alleviates uncertainty by giving users the freedom to understand and control all of the information they share.

Research Question and Methods

The guiding question for this research will be: How can location-based technology enhance interactions and foster new relationships at career networking events while mitigating potential ethical concerns associated with real-time information sharing? This research focus will require further analysis into how anticipation can cultivate the responsible design of location-based technology and will provide the foundation for developing Icebreaker as a socially robust platform.

The first approach that will be used to pursue this research question will be analyzing case studies of location-based platforms that were both successful and unsuccessful. Case studies will be a useful research method for this research question because they provide concrete historical evidence of how the technical design of location-based platforms can lead to unanticipated consequences that can be improved upon with this technical project. For example, one case study discussed the ethical dimensions of research design in order to show how the design of Yik Yak, an anonymous, location-based platform, allowed the platform to turn from a harmless social media to a voice of cyber-bullying and racism (Li and Literat, 2017, p.1). The platforms examined in these case studies like this one will be tabulated with a list of what negative social outcomes resulted in order convey a general sense of the most common ethical challenges faced by creators of location-based platforms.

The second approach will be conducting a contextual inquiry through both pre-recorded and live interviews of entrepreneurs and experts in the field of LBS as well as surveying university students, who would be primary stakeholders for many social location-based networking platforms. The purpose of interviewing experts and entrepreneurs will be to gather deep insights on the current state-of-the-art in location-based technology and how privacy preservation techniques are being used in both the public and private sectors. I hope to interview

professors who have experience researching either Bluetooth or location-based technology, as well as entrepreneurs who have worked on location-based platforms such as X-Mode's founder Joshua Anton, a UVa alum who started one of the most prominent location-based technology firms today. I also hope to interview creators of contact-tracing protocols and mobile applications, as this will provide useful insight on how recent events spurred new proximity tracking and what challenges lay ahead for privacy preserving contract-tracing. I also plan to survey university students to understand public perception of popular contact tracing platforms in Virginia, particularly among frequent smart phone users. I hope to use this example to understand how privacy concerns may have impacted the utility these applications offer and further inform how future LBS platforms can improve in-app responsiveness. As part of this survey, I plan to ask for their input in a horizon scanning exercise, in which they rank their perceived likelihood of different future scenarios regarding the platform happening such as a growth in user retention or concerns about data privacy. These Likert rankings will then be plotted to understand how LBS features are perceived, and these will be compared against the rankings of other forms of proximity tracing in social LBS platforms. This analysis will provide insight into how smartphone users perceive LBS platforms and suggest how developers can create user centric LBS by mitigating future risk.

Conclusion: Timeline and Expected Outcomes

The outcome of this research will be to first guide the responsible development of Icebreaker, a location-based platform that allows users to view and exchange digital business cards with nearby users at professional networking events. Additionally, this research will demonstrate how responsible innovation, particularly anticipation, can be used to address the social challenges faced by location-based platforms. In order to carry out this research, the case

studies will need to be identified by the end of January, and the questionnaires for the contextual

inquiry will be set up and filled out by February. March will be dedicating to reading and

annotating the chosen case studies, as well as getting in contact with potential interviewees from

the student and recruiter work roles. In April-May, the interviews will be conducted and the

results tabulated in order to draw insights from the statistical analysis of this data. The results of

this research will provide my technical project with key design considerations based off the

ethical concerns of important stakeholders as well as stimulate further research efforts into how

location-based technology can mitigate social consequences.

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