ABSTRACT
Mobile devices have become a popular form of interacting with others, even those in a shared setting. When co-present, communication mediums like SMS and IM also provide channels to engage in discussions that parallel larger, more central discussions, such as lectures and presentations. In the interest of exploring this phenomenon, we present Backchannel, a mobile application for communicating with those around you discreetly. We have two goals with this project. First, by sampling other mobile communication mediums, we seek to develop a novel location-sensitive method of interacting with others. Secondly, we wish to observe its use among actual mobile device owners and capture any emergent behavior that arises.

ACM Classification: H5.2 [Information interfaces and presentation]: User Interfaces. - Graphical user interfaces.

General terms: Design, Experimentation, Human Factors

Keywords: Mobile, chat, location-aware, evaluation

INTRODUCTION
Cell phones have become a ubiquitous form of communication in many parts of the world. Uses for cell phones besides voice, such as text messaging and email, are also gaining popularity. Newer devices, such as smartphones and PDAs, can now accommodate applications, which allow for even more sophisticated forms of communication.

An interesting phenomenon that has emerged in the use of mobile devices has been its uses for discrete secondary communications that parallel larger central ones. For example, text messages are often used in academic or work settings to engage in discussions while others are presenting or otherwise commanding attention. The nature of these discussions can range from inquiry to coordination to outright distraction. They can involve people both present and absent, involved and uninvolved. Where the technology permits, other media can come into play, such as email and the web. The discreet nature of these technologies, which can be used silently, out-of-sight and with minimal eye contact, facilitates their use in the presence of other discussion, whether it is desired or not.

Much research has gone into the nature of this interaction. While sometimes considered a disruption or discourtesy to the speaker, many researchers are now curious as to the benefits of these quiet backchannels of communication. For example, one might seek clarification about a particular topic mentioned during a lecture. Rather than disrupting the lecture immediately or deferring until a point at which a question may be posed (during which the issue may be forgotten or complicated by further topics), one could consult with a friend or classmate discretely for an answer [6]. Similarly, a task or agenda that arises during a meeting might require coordination with others. The ability to redress immediately and without interruption to the meeting has proven a demonstrable benefit [5]. Lastly, the ability to discuss a talk or presentation at which multiple people are present can be found to engage rather than distract from the topic at hand. At academic conferences, multi-user chat has been used to allow groups to discuss ideas that arise over the course of a lecture, formulate questions for the presenter, and then collaboratively judge which to pose in the limited Q&A time that follows [3, 4].

These scenarios typically involve people in a shared setting communicating with those around them. However, this poses an issue for most current mobile-based chat applications. Chat applications are typically identity-based—that is, one must know the name or another identifier (such as a phone number or screen name) of those they wish to speak to. Where all participants are familiar with each other and possess each others’ identifiers, this is not an issue. However, this precludes some settings mentioned earlier (such as a classroom or conference), where one may not know the identifiers of those they wish to speak with, even if they were otherwise acquainted. The use of room- or channel-based chat systems, such as IRC, has been used to circumvent the issue of knowing the identifiers of everyone involved. However, these systems still required all participating to know the channels or servers to connect to in order to join the conversation.

To address these issues, we have developed Backchannel, a mobile application and supporting framework for engaging in discussions with co-located people. By leveraging location-aware technology (such as GPS) on modern phones, we can form channels of discussion framed by location as well as by topic and participants. This eliminates the coordination issues with channels and identifiers, and simply requires both parties to make use of the application in the setting that they share. When secondary conversations can be formed and dissolved so spontaneously, we are curious to see what behavior emerges amongst users, and how it
parallels other existing forms of communication, both primary and secondary.

**SYSTEM OVERVIEW**

Backchannel is built upon several existing chat and mobile technologies, used in concert to produce a new experience. The overall design of Backchannel involves two major components: a networking layer that manages the presence of and interaction between users; and a client layer which monitors a user’s location and provides a familiar interface for communicating with others.

The **Model**

Backchannel is built around the concept of *discussions*—that is, multiple people engaged in a conversation with each other. This parallels similar concepts like rooms and channels in other chat applications. Discussions can be initiated by anyone, and can be open to anyone (public) or limited to a particular group of people (private). Discussions also are framed around a *location*, typically the physical location of the person who formed it. Discussions can also have a *scope*, a limitation on how close one must be to its location in order to be seen or joined. When one joins the Backchannel network, they are presented with a list of public discussion whose scope they fall within. These are typically listed in order of distance, with discussions located nearby appearing before those further away.

Users on the Backchannel network are identified by a *handle*, a name they choose when they log in. A handle must be unique at the time the user logs in (i.e. there cannot be two people with the handle Bob online at the same time). However, there is no way currently to reserve a handle exclusively for a single person. Some form of *handle registration* is left for future work. Once online, users may join one or more discussions, where they will be identified by their handle. *Messages* can be sent to these discussion, where they will be displayed for all other members of the discussion. In addition, *private messages* can be sent to individual users directly.

The **Network**

The Backchannel network is built on Jabber, an open-source framework for real-time messaging and presence [1]. Jabber is a mature framework with a large base of developers and users, making it an excellent candidate for our system’s chat functionality. Given that it is open-source, it is also quite extensible and has been ported to many platforms, including mobile devices. Thus, adding new functionality onto the existing framework would not pose any issues.

Two particular pieces of functionality required for our system are multi-user chat and location-awareness, neither of which are present in the Jabber protocol. To address this, we created a *bot*, written in Java, which coordinates all communication amongst users in Backchannel. When a user joins Backchannel, he is actually initiating a Jabber chat with the bot. The user’s client passes along identifying information about themselves (namely, their handle and their location) to the bot. The bot then uses this information to provide a list of discussions which are visible to the user. When the user joins or leaves a discussion, he sends a request to the bot, which then alerts users currently in the discussion. When a user sends a message to the discussion, it is relayed through the bot, who then sends it to all other users in the discussion. Private messages are handled similarly between users.

The **Client**

The initial Backchannel client was designed as a web-based application for the iPhone. This platform was chosen for several reasons. Foremost, the iPhone provided a modern application and web framework on which to develop a client. In its standard configuration, it provided all the hardware functionality (Internet connectivity, GPS) required for the client. In addition, it had achieved sufficient consumer penetration to assume a cursory familiarity amongst users (far more so than other comparable smartphones). The web platform was chosen for ease of development and deployment. Using bridging frameworks such as PhoneGap, it was also possible to use the iPhone’s hardware functionality from a web page [3]. Connection with the Jabber network was accomplished using the JavaScript Jabber Client (JsJaC) library [2].

The interface itself was designed to be simple and to reflect the typical iPhone application’s appearance. When begun, the user will be prompted to specify a name they wish to be identified by (their handle). After submitting this information, their handle and location will be provided to the Backchannel network, and they will be supplied a list of current discussions. Besides those discussion initiated by other users, there are always *open discussions* set up at various distances (e.g. in this room, in this building) from the user. These discussion consist of every user that falls within this distance, regardless of what discussions they are a part of. This provides users with an initial meeting point, as well as a sense of how many people are chatting around them.

The user may choose to join an existing discussion, or create a new discussion of their own. Once a discussion is joined, the user will be presented with a chat screen, showing what each member of the discussion is saying. If the user selects the chat box at the top of the screen, he can enter his own comments into the discussion. Comments are sent to other users as they are being typed, rather than when they are complete. The user will have the option of disabling this feature in the future, but it was left in to observe user reaction during the evaluation (see below).

Several features provide the user with better control of how and with whom they interact. Within a discussion, the user can choose to ‘hush’ a user, which will cause his messages to appear in a smaller type, less commanding of the user’s attention. The user can also ‘focus’ another user, causing his messages to appear highlighted in blue, more commanding of his attention. Problematic users can be ‘ignored’, causing their messages in discussions and in private to be discarded. When a user creates a new discussion, he
can ‘invite’ other users to join that discussion, locating them by handle or by location.

**EVALUATION**

While the Backchannel system provides new avenues for interaction, the true test of its worth would be in the hands of actual users. How (or if) users adopted this system would offer us insight not only into the design of the system, but how people use mobile devices to form the eponymous backchannels of discussion.

**Study Design**

To evaluate the Backchannel system, multiple simultaneous users would need to be involved. The users ideally would have some interest of communicating with each other discreetly, and would be familiar with (or curious about) how to do so with mobile devices. It also interested us as to how they would react to or interact with others they were not familiar with using the system. Lastly, we wished to observe the use of the system in a situation where they could not easily communicate verbally, such as a class or lecture.

With these considerations, we proposed subject pools of 4-6 people. Within each pool, we sought pairs of people that were acquainted and would be interesting in communicating with each other. However, where possible we tried to assure at least several participants were not acquainted, and thus would have no preexisting reason to chat. These participants should together be attending a public event, such as a class or conference, in which they would be in physical proximity but not necessarily able to speak directly. In addition, we looked for participants that had a passing knowledge and/or interesting in mobile applications and chat.

In a preliminary session, each participant would be provided with a brief survey to gauge their familiarity and opinion of mobile devices and chat. After completing the survey, the pool of participants would be provided an iPhone preloaded with the Backchannel application, and given a brief overview of its use and purpose. They will then be left to use applications and devices freely for the course of the event. During this process, the client and bot will keep logs of their discussions and interactions with the device. In addition, the investigators will directly monitor their use of the device and make note of any novel activity. At the end of the event, the users will be asked to complete a brief survey describing their experience with application.

Provided the event attended is a recurring one (e.g. a weekly class or a multi-day conference), we will attempt to perform a second evaluation session with the same participants. This will help account for learning and novelty biases resulting from their first encounter with the application and/or device. The second session will proceed the same as the first, with a brief introduction followed by monitored but free use. Following the second session, rather than offering a survey, the investigators will have a brief focus group with all the participants. This will offer participants the chance to provide more detailed feedback and discuss their experience with each other, while the investigators will have the chance to refine their questions in response to the group’s feedback.

**User Background**

After having performed our studies, analyzing our gathered data resulted in somewhat mixed reviews and correlations in some areas. Most of our concrete distinctions were made in our user background research in which we were able identify clear patterns in mobile device usage in the age 21-25 college-attending male demographic. Limitations on available and willing subjects limited our intentional demographic. However, we feel that given the broad range of educational disciplines of these subjects that our results provide a good representation of our sample population. In accordance with our original expectations, our entire sample population owns and regularly uses mobile communication devices (albeit only 78% of whom own an iPhone) and provides a good test base as our intended audience for this application is those who own mobile devices and regularly utilize non-verbal communication with others (i.e. instant messaging, email, and text messaging).

In trying to identify behavior patterns in our study for users of different personality types, we asked how they would describe themselves in a level of introvertedness and extrovertedness. Approximately 77% of the subjects either identified themselves as being somewhat introverted or somewhat extroverted. The clear winner, however, being somewhat extroverted with approximately 44% answering so. We also asked the subjects whether they have communicated non-verbally with someone they did not previously know from which approximately 2/3 indicated that they had done so at some point. The interesting correlation from these two pieces of information is that the number of individuals identifying themselves as being somewhat extroverted were split in the respect of the aforementioned non-verbal communication. On the other hand, 2/3 of those identifying themselves as somewhat introverted indicated that they had communicated with someone with whom they were unfamiliar. From this, we speculate that, whereas some extroverts may prefer verbal communication with strangers, our application may provide a basis for self-proclaimed introverts to communicate with others in a non-threatening manner. However, roughly half of our subjects felt generally pessimistic about the perceived benefits and value-gained from non-verbal communication with individuals they did not know. Because its nature, we can venture to assume that many individuals simply lack the trust of unknown others in the sense of communication and may not be inclined to fully depend on the application.

**Application and Device Backgrounds**

Users were asked to indicate how regularly they use common communication features of many mobile devices. The provided options are listed in Q2 of Appendix B. To evaluate the overall popularity of certain items based on the frequency of their usage as indicated by our subjects, we applied a weighted analysis on each response to give more weight to more frequently used items. From this we were able to identify that the overwhelming majority of device
usage are between both making phone calls and sending text messages; approximately 95% of the responses indicated that this was a feature used several times per day. Interestingly enough, the indicated popularity of making phone calls is only popular over sending text messages by a variance of approximately 1% over all features. Less popular, but still significant and closely valued, are both browsing the web and reading email. The least used feature of was unanimously conference and three-way calling, with approximately 78% indicating they never use this feature. What should be noted here is that out of three options for text-based mobile communication, the combined popularity of both instant messaging and email is still less popular than text messaging indicating a dominance in this area.

Users were also asked to indicate the types of features of a mobile based application they felt were most important. The options available to them are listed in Q3 of Appendix B. Rather than identifying a clear winner in this item, we instead noticed a generally evenly distribute response on overall importance. From our sample set, the most important quality (100% of the subjects indicating the features was important or very important) with an overall variance of popularity of 1-2% across all options was the cost of the application. Coming in behind this was how well the application increased or positively influenced the on-the-go productivity. Approximately 88% indicated this feature was either indicated as important or very important.

Other questions were designed to gauge users’ preferences in features that are generally common to both our application and other chatting applications and previous exposure to similar communication and situations. In asking our subjects on what features of chat applications they felt were most important in chat applications they use or would use, we received responses indicating that both the number of friends they had using the application and the responsiveness of the application interface ranked among the majority in preference. These provide interesting predictions on how users used our application during the session as will be discussed later. The most notably important aspect after these was the ease of use of the application. The least important features to our subjects were indicated to be the number of features the application offers, the level expressiveness a user has while chatting and the level of similarity to face to face communication.

Also, we found that the majority, approximately 78%, of the subjects do not use chatting applications to communicate with people they do not know. However, roughly 90% of those surveyed indicated that they thought that the ability to communicate with someone unknown to them would assist in contextual understanding and comprehension either sometimes or often. Seeing this leads us to believe that the application maintains at least some level of viability as a useful application in understanding contextual meanings of lectures, conferences and conversations.

**Monitoring the Experiment**

While conducting the experiment we made notes of any particulars in user behaviors that may have some significance to our work with the application. One of the most significant aspects of the application usage that we noticed among users was the mixture of both formal and informal conversation with complete disregard that other users were aware of what they were saying. Occasionally, the subjects would primarily use the application for an informal conversation with a peer and would lose attention to the material of the situation (e.g. lecture). We feel that this may not necessarily make any presumptions about our application in specifics. Rather, we believe this to be the nature of using a device to facilitate communication, or even traditional communication for that matter, in the sense that users had a tendency to be heavily involved in the conversation at times when other users engaged them but much less so when not directly interacted with.

We also noticed that subjects involved in the study who knew each other prior to the experiment would not communicate entirely using the application. In many circumstances, acquaintances would visually acknowledge someone else as either a response to a chat statement or to gain their attention to read a chat statement. One of our thoughts concerning this behavior is that at some point it was simply easier for the subject to speak to someone rather than type. We feel that this may be a possible indication of a problem with either the interface of the application or the nature of trying to communicate messages in real time. Those considered strangers to some of the users did not exhibit the same behavior. Rather, the users with whom others were unfamiliar would oftentimes use the application with no regard for anyone else using the application within the same room.

While using the application, most users demonstrated that for most of the time, they were simply exploring the features of both the phone and the application. It’s quite possible that our application, while providing a service, simply looked interesting to users, causing them to want to explore its features. It should also be noted that this behavior occurred at times of low chat volume. In this respect, one could come to the conclusion that the application is only of use at points when someone wishes to engage in conversation or pose a question. In other words, users seemed distracted to other items in the interface at times when no other user wished to engage with them. Our feeling is that subject lack of experience with the application may influence how they have perceived what the application actually does, regardless of any explanation given to them.

Content of conversations seemed to be social for the most part. In our exit surveys, users indicated that on average they spent approximately 50% of the experiment time discussing unrelated personal topics. Our impression from this is that the implications of using a chat application are rooted in the fact that users are not communicating for one specific purpose. In actuality, it would seem that conversations mimic verbal ones; they may be topical in one mo-
ment and not at another. This provides an interesting insight into our original vision for the application. Our original goal was to create an application that provides a real time messaging system that is meant to aid in contextual understanding in a location sensitive environment. However, monitoring user behavior indicates that our application may be better suited as a generic location sensitive messaging system that has no specific implications on being targeted for lectures or conferences. For instance, in this respect, the application could work well in a living environment to communicate quickly from one location to another.

Negative feedback seemed to occur regularly. Most users seemed to express distaste or frustration over some of the quirks of the application. Many of these were brought up in a post experiment focus study. During the experiment, many users seemed to type somewhat slower than expected. Our original thought was that this was attributable to the iPhone itself; however, our background surveys indicated that about 78% of our subject base owns an iPhone and every single one of these have owned the device for 1-6 months. On second look, we noticed that user keystrokes would slow during times when other users were also typing. It seems that the real time character feed aspect feature of the application in some respects distracted the users from performing the task of typing. In fact, focus groups indicated an overall consensus that real time character updates were generally unnecessary.

Monitoring the experiment did yield some unexpected results that were previously unaccounted for in our initial plan for how this application would be used. First of all, several users very quickly found that they could use the application much easier by viewing the iPhone in landscape mode. Upon completion of the experiment, focus groups indicated that the landscape mode provided an easier, two-handed method for inputting text into the application; however it hindered the visibility of the application. Our initial approach did not account for this feature that is very common among many iPhone applications. This may indicate a need to re-evaluate the notion of screen real estate for future work on the application. Another surprising result we did not expect was that at some points in the experiment, users would assist their confused or troubled peers when there was a question about the application or how to perform some particular action. The original expectation and hope was to have the interface simple and clear enough for a user to not need 3rd party intervention. However, because of our subjects’ previous ownership and exposure to the iPhone, we believe that the nature of our interface is in some respects confusing to the user and may need additional research.

**Post Experiment**

After the experiment was complete, users were asked to complete an exit survey intended to gauge their reactions and thoughts on the application and also participate in a focus group to openly discuss several aspects of the application and experiment. From our exit survey we discovered information supporting our claim that problems with communication were caused by the application and not lack of exposure to the iPhone; roughly 80% of our test subjects indicated they had either above average or excellent experience with the iPhone. However, there seems to have been some results that contradict blaming the application. Over half of the test population described the application as above average ease of use and felt their experience average. Original expectations based on observation had indicated that this would be more negatively influenced.

With respect to amount of usage during the experiment, approximately 80% indicated they used the application some of the time or most of the time. This was directly noticeable throughout the experiment. What is interesting, though, is that whereas we speculated that the confusions and distractions with the interface resulted in no significant amount of useful conversation, all of the test subjects identified the application as being at least somewhat helpful in aiding their contextual understanding of their environment.

Overall, users indicated in both the exit survey and the focus groups that their overall impression of both the concept of the application and the application itself were positive. Approximately 60% of the test subjects felt the application concept was indeed a useful one and most test subjects felt this was an application they could see themselves using. However, close to 70% of the user base felt that the features of the application were sub-standard in comparison to other non-verbal communication, indicating a need to re-evaluate many of the interface options and mechanisms.

Focus groups generated a multitude of useful feedback about the overall “goodness” of both the application concept and the user interface. An overwhelming majority of population indicated they felt the real time character stream feature was unnecessary and distracted from the application. Most of the users were also very dissatisfied with the quickness of the interface. Their primary complaints consisted of negative comments about character lag time and that application was generally slow and unresponsive at times. Several users indicated they felt the window size was somewhat inhibitive to communication and made using the application cumbersome. This provides validation to background study in which mobile based instant messaging was among one of the least used features among our test base. Upon asking of their expectations of what the application would do or some of the features it would provide, users in the study indicated several items including the ability to view message history, vibrate alerts (much like text messages) and a more robust way to see who is in the discussion room. Upon discussing what they thought the application would do when actively using it, many indicated that the notion of one group of messages provided little context to what one message meant in relation to another. Ideally, they had indicated that they would be able to click on a specific message and reply directly. Many of them expressed the concern with what would happen if users were to digress from the discussion at any point.
They felt that using the application may be distracting instead of useful if this were to occur.

Most of the subjects expressly stated that they had significant problems with not being able to review older messages. They felt that their contextual understanding of a conversation was inhibited because they were not able to review what someone else had said as is with many other communication channels.

Overall, many of the users indicated that they felt the application is overall viable in a conference or lecture setting. Many of them envision this type of application useful in the professional world for those who frequently attend conferences as part of sales or consulting jobs. For this reason, several users suggested extending application support to more common business phones such as Blackberry. Some users also suggested the application be available to those on laptops as well, feeling that this would provide benefit of using the application to those who do not have access to a supported mobile device.

On suggestions for future enhancements of the application or the concept, the top priority for most users was the response time of the application. Behind this, the ability to track specific conversations or respond directly to a single message was important as well. Our background study indicated that the cost of a mobile application is the number one factor a user considers when deciding to use it or not and therefore demonstrates the suggestion that the application should be freely available. Our interpretation is this would make wide-spread adoption, another important aspect a user considers in mobile applications, much easier. Finally, among subjects there was a significant concern regarding spam or unwanted messages. The general consensus was that the chats and conversations should in some way be moderated in some sense (i.e. the ability to block a specific user).

FUTURE WORK
Overall, we felt our implementation was significant enough to obtain enough concrete user feedback to provide a clear roadmap for future research in the area. Much of our direct feedback from test subjects indicates that the concept of the application is indeed viable for its intended purpose. With the majority of our research subjects indicating the application is something they see themselves using on a regular basis, we propose that much effort be taken to increase the overall robustness of the application as well as correcting some of the performance issues. First and foremost, user study indicated that there needs to be a re-evaluation on whether or not character by character message updates is indeed a useful feature to the application and whether or not it actually provides in contextual understanding of the communication. In this respect, we suggest analyzing the theoretical service load handling both with and without real time text streaming to see if this increases the responsiveness of the application and thus the overall user experience. Also, many users suggested a fair amount of feature add-ins for the user interface to either correct some its drawbacks or improve upon the concept and make it a more familiar platform for a broad scope of users. We suggest finalizing a list of features that could be incorporated within the application that align themselves with the fact that the majority of users that communicate via mobile devices utilize the same mechanisms (e.g. text messaging and email).

ACKNOWLEDGMENTS
The authors would like to thank Nirmal Patel and Thad Starner for their feedback on the design of our user study.

REFERENCES
Appendix B. Background Survey

This survey is intended to provide us information about your past experience with mobile and chat applications. Please take a minute to fill it out in its entirety. If you have any questions, feel free to ask one of the investigators for assistance.

Mobile Devices

Q1. Do you own a cell phone or other mobile communication device?

☐ Yes

☐ No

Q2. If yes, how often do you use your mobile phone for the following activities?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Never</th>
<th>Once a Week or Less</th>
<th>Several Times A Week</th>
<th>Once a Day</th>
<th>Several Times a Day</th>
<th>Not supported by my phone.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making Phone Calls</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sending Text Messages</td>
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<td></td>
<td></td>
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<tr>
<td>3-Way or Conference Calls</td>
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<tr>
<td>Browsing the Web</td>
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<tr>
<td>Reading/Sending Email</td>
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<td></td>
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<tr>
<td>Instant Messaging</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Q3. What qualities do you find important in a mobile phone application?

<table>
<thead>
<tr>
<th>Quality</th>
<th>Not Important</th>
<th>Somewhat Important</th>
<th>Important</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much it will cost to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How easy it is to acquire and access</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How easy it is to use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How much it lets me do on-the-go</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How fast and responsive it is</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>How often or many places it can be used</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Q4. Do you currently own (or have previously owned) an iPhone?

☐ Yes
☐ No

Q5. If so, how long have you owned it?

☐ Less than 1 month
☐ 1 – 6 months
☐ 6 months or more

**Chat Applications**

Q6. How often (if at all) do you make use of the following technologies to chat with others?

<table>
<thead>
<tr>
<th>Technology</th>
<th>Never</th>
<th>Once a Week or Less</th>
<th>Several Times A Week</th>
<th>Once a Day</th>
<th>Several Times a Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Text Messaging (SMS)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Instant Messaging (AIM, MSN, etc.)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Multi-User Chat (IRC, etc.)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Internet Telephony (VoIP, Skype)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Video Conferencing</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Virtual Environments (Second Life, etc.)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Q7. What would you consider your top 3 ways of chatting with people in real-time?

Please mark these as 1, 2, and 3 in the list below. If you use less than 3, only count those that you use.

<table>
<thead>
<tr>
<th>Technology</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>_______</td>
</tr>
<tr>
<td>Text Messaging (SMS)</td>
<td>_______</td>
</tr>
<tr>
<td>Instant Messaging (AIM, MSN, etc.)</td>
<td>_______</td>
</tr>
<tr>
<td>Multi-User Chat (IRC, etc.)</td>
<td>_______</td>
</tr>
<tr>
<td>Internet Telephony (VoIP, Skype)</td>
<td>_______</td>
</tr>
<tr>
<td>Video Conferencing</td>
<td></td>
</tr>
<tr>
<td>Virtual Environments (Second Life, etc.)</td>
<td>_______</td>
</tr>
</tbody>
</table>
Q8. What do you consider important in a chat application?

<table>
<thead>
<tr>
<th></th>
<th>Not Important</th>
<th>Somewhat Important</th>
<th>Important</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>How easy it is to use</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>How many features it offers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>How fast and responsive the interface is</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>How expressive the communication is</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>How similar it is to face-to-face chat</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>How many people I know that use it</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>How many people that use it in total</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Q9. Do you use chat technologies to talk to people you do not already know?

☐ Yes
☐ No

Chatting with Others

Q10. Do you use a chatting application (IM, email, etc) to communicate in classes, lectures, or other similar circumstances?

☐ Yes
☐ No

Q11. What is your preferred method of non-verbal communication in class, lectures, or other similar circumstances?

☐ Yes
☐ No

Q12. How often do you find yourself in a situation where non-verbal communication with someone near you would help your understanding or comprehension?

☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always
Q13. When trying to gain some information, do you feel limited by your "buddy list" or list of known contacts?
- Yes
- No

Q14. Have you ever attempted non-verbal communication in this manner with someone you do not know?
- Yes
- No

Q15. Do you feel non-verbal communication with a group of people you do not know would help your understanding or comprehension?
- Absolutely not
- Possibly, but not likely
- Don't know
- Likely
- Absolutely

Q16. When chatting/communicating in a lecture scenario, how often are your discussions related to the topic of the lecture?
- Never related
- Rarely related
- Sometimes related
- Often related
- Always related

Q17. How would you describe yourself?
- Very introverted
- Somewhat introverted
- Don't know / No answer
- Somewhat extroverted
- Very extroverted
Appendix C. Interim Survey

This survey is intended to provide us with information about your initial experience with the iPhone and Backchannel application. Please take a minute to fill it out in its entirety. If you have any questions, feel free to ask one of the investigators for assistance.

Q1. How would you describe your experience with the iPhone?
   - Poor
   - Below average
   - Average
   - Above average
   - Excellent

Q2. How would you describe your experience with Backchannel?
   - Poor
   - Below average
   - Average
   - Above average
   - Excellent

Q3. Did you find Backchannel difficult to use?
   - Very difficult
   - Somewhat difficult
   - Average
   - Somewhat easy
   - Very easy

Q4. How much of your conversations were related to the topic of the lecture?
   - 0%
   - 25%
   - 50%
   - 75%
   - 100%
Q5. How much did you use the application over the course of the lecture?
- Never
- Very little
- Some of the time
- Most of the time
- Constantly

Q6. How well did the application help your communication?
- Not helpful at all
- Not very helpful
- Somewhat helpful
- Very helpful
- Extremely helpful

Q7. Did the application make you feel compelled to communicate?
- Very much
- Quite a bit
- Somewhat
- Mostly not
- Not at all

Q8. Compared to other chatting/communication mechanisms, how would you describe this application?
- Much worse
- Somewhat worse
- About the same
- Somewhat better
- Much better

Q9. How useful do you think the concept of the application is?
- Not useful at all
- Not very useful
- No opinion
- Somewhat useful
- Very useful
Q10. Could you see yourself using this application in the future?

- Yes
- No

Please provide any recommendations or feedback about the application you would be interested in sharing.

This part of the survey is optional. You will also have the opportunity to provide feedback in the focus group that follows the second session.